A study to evaluate the quality of medication-related information in the discharge summary of elderly patients discahrged from an acute hospital

Purser, Kevin Anthony

Awarding institution:
King's College London

A study to evaluate the quality of medication-related information in the discharge summary of elderly patients discharged from an acute hospital

Kevin Anthony Purser

Student Number 85941310

A thesis submitted in partial fulfilment of the requirement for the

Doctor of Healthcare of King's College London

Institute of Pharmaceutical Sciences

King's College London

2 July 2018

Abstract

It has been found that patients are often readmitted to hospital due to medication-related incidents. The quality of medication-related information in the discharge summary may be a contributory factor leading to readmission. This study evaluated the quality of medication-related information in a discharge summary of elderly patients discharged from an acute hospital in relation to locally determined standards. The study was carried out in three phases: Phase I involved determining a local consensus for the essential or gold standards and desirable standards for medication-related information on a discharge summary using a modified e-Delphi technique. Phase II was carried out to measure the level of adherence to the standards determined by a retrospective, observational study of elderly patients of 65 years of age or older discharged from an acute hospital. Phase III involved a local expert panel assessing whether any subsequent readmissions within 30 days were due to the quality of discharge information. The results of the modified e-Delphi study using an expert panel had a response rate of 55.2% after round one and 34.4% after round two and provided the local standards. 155 patients' discharge summaries were then evaluated. An overall adherence score of 64.6% was found in relation to the gold standards. A level of adherence of 51.1% with medication changed with a reason stated on the discharge summary; 75.4% for medication stopped with a reason stated on the discharge summary and 84.8% for medication started with a reason stated on the discharge summary was found. There was some evidence that GPs do not always act upon the information in the discharge summary. In Phase III it was found that six patients were readmitted to hospital within 30 days due to medication with only two (1.3%) influenced by the quality of medication-related information. The study discusses the implications for clinical practice in preparation of a gold standard discharge summary including the need to design electronic discharge templates to include the gold standards and recommendations for training of junior doctors. An assessment tool to prioritise high risk patients to produce high quality discharge summary medication-information is proposed.

Table of Contents

Table of Figures

Table of Tables

Acknowledgements

The opportunity to undertake Doctorate studies has been something I have always wanted to do. Having studied pharmacy at Chelsea College both as an undergraduate pharmacy student and postgraduate Masters student, King's College was always the place to do it. I would like to sincerely thank my supervisors for their patience, encouragement, and guidance during the time of undertaking this thesis. To Professor Graham Davies and Dr Vivian Auyeung, you have given me your time and support which has helped me finish this thesis especially when the pressure of a busy NHS role was becoming difficult. I have gained so much from your expertise and approach of research methods and academic rigour for which I am very grateful. I would also like to thank the late Professor John Gorrod who I got to know when he relocated to Essex. He always believed that I could complete this work and was a source of great encouragement to me to complete my Doctorate studies.

I would like to express my thanks to colleagues at work, both pharmacy and medical staff, who have supported me to complete this study whilst having their own work to deal with. I am indebted to Dr Cristian Dogaru from the University of Suffolk for his advice on statistical analysis, and to Sharon Hnatiw for her specialist, expert support and work in presentation of this thesis, for which I am very grateful.

To my family - my mother for her support to become a pharmacist in the first place. To my children - Emily, Hannah, and Laura who have all helped me get through this in different but important ways - thank you. Last of all but not least to Pauline - my wife - whose encouragement, sacrifice, support and faith during this thesis has meant so much to me and I would not have been able to do this without your help - thank you.

Declaration

I, Kevin A Purser, declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree and does not incorporate any material already submitted for a degree.

Abbreviations

Abbreviation	Meaning
ADE	Adverse Drug Event
ADR	Adverse Drug Reaction
AMR	Admission Medicines Reconciliation
AMS	Anticoagulant Monitoring Service
ANOVA	Analysis of Variance
APAC	Australian Pharmaceutical Advisory Council
ART	Assessment of Risk Tool
ATC	Anatomical Therapeutic Classification
BMA	British Medical Association
CCG	Clinical Commissioning Group
CCI	Charlson Co-morbidity Index
CI	Confidence Interval
CQC	Care Quality Commission
CQIT	Clinical Quality Improvement Task
DDD	Defined Daily Dose
DMR	Discharge Medicines Reconciliation
DMUR	Discharge Medicines Use Review
DTOC	Delayed Transfers of Care
EU	European Union
FY	Foundation Year
GMC	General Medical Council
GP	General Practitioner
HEPMA	Hospital Electronic Prescribing and Medicines Administration
HIQA	Health Information and Quality Authority
HSCIC	Health and Social Care Information Centre

Abbreviation	Meaning
ICD	International Classification of Diseases
IDL	Immediate Discharge Letter
IHI	Institute Healthcare Improvement
IHT	Ipswich Hospital NHS Trust
IM	Intramuscular
INR	International Normalised Ratio
IQR	Interquartile Range
IT	Information Technology
IV	Intravenous
JCAHO	Joint Commission on Accreditation of Healthcare Organisations
MD	Mean Difference
MDS	Monitored Dose System
MR	Medicines Reconciliation
MRCI	Medication Regimen Complexity Index
MRH	Medication-Related Harm
MRI	Medication-Related Information
NAO	National Audit Office
NCGD	Non-Career Grade Doctor
NHS	National Health Service
NHSI	National Health Service Improvement
NICE	National Institute of Health and Care Excellence
NKDA	No Known Drug Allergy
NPC	National Prescribing Centre
NPSA	National Patient Safety Agency
NRLS	National Reporting and Learning System
PAS	Patient Administration System
PHP	Pinnacle Health Partnership
PMR	Pharmacy-led Medicines Reconciliation
POD	Patients Own Drugs

Abbreviation	Meaning
PRSB	Professional Records Standards Body
RCP	Royal College of Physicians
RPS	Royal Pharmaceutical Society
SCR	Summary Care Record
SD	Standard Deviation
SHO	Senior House Officer
SIGN	Scottish Intercollegiate Guidelines Network
SPSS	Statistical Package for Social Sciences
ST	Specialist Training
TTA	To Take Away
TTO	To Take Out
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

Standards

Abbreviation	Standard
Essential or Gold	
E1	Route of administration
E2	Duration of a course
E3a	Generic name stated
E3b	Dose stated
E3c	Frequency stated
E4a	Strength specified
E4b	Formulation specified
E5	Duration of long term specified
E6	Details of monitoring or review required specified
E7a	Record of medication stopped
E7b	Record of medication started
Desirable	
D1	Details of Adverse Drug Event specified
D2	Details of date and last dose given
D3	Details of no medication given
D4	Allergy status specified
D5a	Reason for medication stopped
D5b	Reason for medication started
D6	Reason for medication changed
D7	Details of adherence problems stated
D8	Contact details given of whom to contact
D9	Reason or indication specified
D10	Details of verbal advice provided
D11	Details of compliance aids provided
D12	Other relevant contacts provided
D13	Details of written information provided

Chapter 1: Transitions of care at discharge and medication errors - a review of the literature and current practice

1. Introduction to discharge issues

One of the significant challenges facing the provision of healthcare services today is to ensure that patients are treated both effectively and safely on transfer or transition of care from one location to another. Patient health outcomes may be influenced by how safely they transition across different healthcare services, for example on the admission into a hospital and the subsequent discharge from a hospital. There is evidence that there is often a breakdown in arrangements for medication information and supply in the transition of care for patients into hospital, whilst in hospital between various care teams and wards and then upon discharge (NICE, 2007). This challenge is even more so in the context of increasing demands on scarce resources in England with increasing activity, reductions in length of inpatient stay and bed numbers and a population that is getting older and needing acute healthcare more. In 2015-2016 in England there were 16.3 million finished admission episodes, an increase of 2.3% from 2014-2015 and an increase of 28.2% from 2005-2006. This demonstrates a dramatic increase in activity in hospitals. In comparison, the average (mean) length of stay for an episode has decreased to five days in 2015-2016 from just less than seven days in 2005-2006. The age group of patients being treated is also of importance. In 2005-2006 the 15-44 age group accounted for the greatest number of episodes (4.4 million). However, episodes for the 65-84 age group saw the greatest increase rising to over six million in 2015-2016. This is also reflected in the average age of patients being admitted to hospital, increasing from 49 in 2005-2006, to 53 years of age in 2015-2016 (NHS Digital, 2016). Conversely, the number of hospital beds has been declining over recent years. The number of available beds has reduced by more than a half over the last 24 years. This has placed an additional burden on hospital care with bed occupancy rates for acute beds increasing from 87.7% in 2010-2011 to 89.5% in 2014-2015 (Kings Fund, 2015).

One of the consequences of this conflict between an increase in demand and reduction in available beds for an ageing population is less time being available to have a co-ordinated and well-planned discharge process from hospital. This can have patient safety consequences if the discharge is not managed in an optimal manner especially in relation to medication. Two studies investigating the rate of reconciliation discrepancies related

to medicines on admission found that there is a risk of 30% to 70% of an unintentional variation between the medicine being taken before admission and the prescription on admission (Cornish et al, 2005; Gleason et al, 2004). Tam et al, (2005) undertook a systematic review of studies that considered the frequency, type and clinical importance of medication history errors on hospital admission. Twenty-two studies were identified involving 3,755 patients published for English-language articles over the period from 1966 to April 2005. This systematic review found that the error rate for prescription errors on admission was high (up to 67% in some cases). Between 10% and 61% cases had at least one omission error and between 60% and 67% had at least one omission or addition of a drug not used before admission. Of all the 22 studies, only five made a distinction between unintentional and intentional discrepancies of the patient's medication prescribed upon admission. A further concern was that between 11% and 59% of the medication history errors were clinically important and therefore a patient safety issue. This was assessed in the studies by using a consensus method of a panel of experts which included doctors and pharmacists or both. The therapeutic classes most often involved in the medication history errors were cardiovascular agents, sedatives and analgesics.

Whilst these studies were on admission, it clearly demonstrates the risk at the point of transition of care for the patient. Coupled with this is the increasing awareness that timely discharge for patients is crucial, particularly the elderly. Elderly or Older patients for the purposes of this review are those over the age of 65 as they are the main users of healthcare and prescribed medicines (Tangiisuran et al, 2014). They often have multi-morbidities and polypharmacy which may increase further the risk of an adverse drug event (ADE) or error on discharge (NICE, 2017). In the period between October 2012 and September 2013 there were around 10,000 reports to the National Reporting and Learning System (NRLS) of patient safety incidents related to discharge (NHS England, 2014). Of the 10,000 incidents, approximately 33% were related to communication at handover. This area of risk at the point of discharge has identified that patients may be discharged without adequate and timely communication of essential information. Safe discharge from hospital, therefore, requires some key principles to be applied. These principles include having effective discharge planning and for organisations to have medicines reconciliation processes in place. Ideally, there should be a 'whole system' approach to discharge with organisations working together. This 'whole system' approach includes having clear documentation of discharge/transfer plans. When a patient is in hospital it is likely that regular medication will be changed, particularly for

patients who were in hospital after an emergency admission. This means that the patient and/or carer needs to understand how to take the medication regimen and the general practitioner (GP) needs up-to-date information to be able to continue the medication plan after the patient has been discharged (Department of Health, 2003). However, it has been identified that there are deficiencies in the communication of medication-related issues on discharge (Care Quality Commission (CQC)), 2009).

The hospital discharge summary is the accepted document used to communicate information about patient care and ongoing medication-related information. A high-quality discharge summary is important to ensure that medication information is accurate and to a recognised standard to minimise errors and optimise on-going treatment. Van Walraven and Rokosh (1999) found that the content of a discharge summary was more important than the process used to create it. The definition of a high-quality or gold standard discharge summary in relation to medication has been defined to include accurate and relevant details such as the medicine name, dose, frequency, route, duration and reasons for changes in medication (SIGN, 2012; NICE, 2015b).

However, the level of quality achieved in the final discharge summary may be influenced by a number of factors such as: the discharge template design (Hammad et al, 2014) or the training and competence of the person completing the discharge summary (Yemm et al, 2014).

The traditional method of generating a hospital discharge summary is by hand. These handwritten discharge summaries are often written by junior medical staff who may have little or no prior training or experience in producing the discharge summary (Yemm et al, 2014; Legault et al, 2012). Consequently, it has been found that discharge summaries they produced contain more errors compared to those produced by more experienced medical staff (MacAulay et al, 1996). The concept of a 'gold standard' discharge summary has resulted in standards being published to define the minimum dataset that a discharge summary should contain in relation to medication (SIGN, 2012; Aziz et al, 2016). In 2011, the European Union (EU) introduced a directive on the use of electronic discharge summaries to encourage improvements in communication and to reduce prescribing errors (EU, 2011). Despite these official statements of standard setting and processes being advocated, there is still a lack of evidence that this is being put into everyday clinical

practice. Mills et al, (2016) have recently demonstrated the lack of effective implementation of electronic discharge summaries.

This introduction will therefore provide some background to the issues regarding the risks and organisational problems associated with the transition and communication between hospitals and primary care in relation to medication-related information and harm. It will also examine the discharge process and standards related to the content of a 'gold standard' discharge summary.

1.1 Transfer or transition of care from hospital

Whilst the numbers of episodes of care are increasing in hospital, there is a corresponding decrease in the duration or average length of stay. This is in the context of fewer available hospital beds and the rising number of high-risk and elderly patients who require more frequent and complex care (Halasyamani et al*,* 2006). An important responsibility for doctors is to ensure that patients are discharged from hospital care in a safe, timely and efficient manner to improve outcomes and safety. Preen et al*,* (2005) identified that having a multidisciplinary discharge care plan improved the quality of life and experience with discharge for patients with long-term conditions. It is well recognised that during a patient stay in hospital their medication may be changed, and a previous Audit Commission report and other publications have highlighted the need to pay attention to effective processes to safely manage medicines, particularly in the elderly at the point of discharge (Audit Commission, 2001; Duffin, 1998; McMillan et al, 2006; RPS, 2012). To ensure safe and effective transfer of care, any changes in medication must be clearly communicated in a timely manner to the GP when a patient is discharged. The CQC, (2009) undertook a survey of GP practices of discharge summaries received from hospitals and found that only 53% were received in time to be useful. A further study carried out in GP practices found that 39% of the practices reported instances where late discharge summaries had directly compromised patient safety (NHS Alliance, 2007).

1.2 Hospital discharge

A patient will usually have been admitted to hospital for either an emergency or an elective procedure or treatment. Once the patient is medically fit they will be ready for discharge. The final discharge destination will depend upon the functional capacity of the

individual. It will either be a transfer back home, to a community hospital or to a nursing or residential care setting and needs to be well planned and timely. For optimal discharge it has been recommended that it is treated as a process and not an isolated event (Department of Health, 2003). The discharge process should include the production and implementation of a discharge plan to support the transfer of care of a patient. A few key principles for effective discharge and transfer of care have been recommended (Department of Health, 2003).

These key principles include:

- Effective discharge is facilitated by a 'whole-system' approach;
- Discharge is a process and not a single event; and
- The process of discharge planning should be co-ordinated by a named person who is responsible for co-ordinating all stages of the patient's journey.

It is anticipated if these and other key principles of effective discharge are carried out, there will be benefits for patients, carers, staff and organisations such as effective care and optimal use of resources. The stages of effective discharge planning were described by Marks, (1994) and are shown in Table 1.

Table 1: Stages of a discharge plan (adapted from Marks, (1994))

Stage of patient journey	**Comment**
Preadmission	Assessment carried out eg preadmission clinic
Admission procedure	Assessment of patient's needs after hospitalisation
Inpatient assessment and preparation for discharge	Preparation of a discharge plan based on individual's patient needs
Discharge from hospital and implementation of a discharge plan	Provision of transport and medicines including a discharge summary
Post-discharge follow-up	For example, audit of the implementation of the discharge plan such as a satisfaction survey for the patient or GP.

A recent Cochrane review of hospital discharge planning has described the differences between an individualised discharge plan and routine discharge planning (Gonçalves-Bradley et al, 2016). Randomised clinical trials that compared an individualised discharge plan with a routine discharge care plan that was not tailored to individual participants

were analysed. Thirty trials involving 11,964 participants were included in the qualitative review. There was evidence from 12 of these trials of a small reduction in hospital length of stay for patients allocated to discharge planning in trials recruiting elderly people following a medical admission (Mean Difference (MD) −0.73, 95% confidence interval (CI) −1.33 to −0.12 with a moderate certainty of evidence). Also, there was found to be a reduced risk of readmission to hospital at three months' follow-up for elderly people with a medical condition. None of the trials reported in the review commented on the quality of communication in the discharge planning process, which is surprising.

1.3 Timeliness of discharge

The timing of discharge for patients can also be critical and may contribute to how effective the whole process is. In 2016 the National Audit Office (NAO) reported its findings on discharging elderly patients from hospital. It found that nearly two-thirds of hospital bed days are occupied by people over 65 years of age with an 18% rise in emergency admissions for elderly people in the previous four years. It was also reported that 1.75 million hospital bed days were lost due to delayed transfers of care - so-called DTOC in 2015 (NAO, 2016). A concerning aspect of unnecessary delay in discharging elderly patients from hospital is that it can lead to worse health outcomes and increase their long-term health needs. Elderly people can quickly lose mobility and the ability to do simple everyday tasks. It is estimated that 10 days of bed rest for healthy elderly people can equate to 10 years of muscle ageing. This is termed 'de-conditioning' of a patient (Vernon, 2016; Gillis and MacDonald, 2005). Hospitals need to have in place effective and timely discharge processes to ensure that delays in discharge are minimised. Issues that can reduce delays in discharge include the minimisation of waiting times for diagnostic tests, waiting for senior medical review to authorise discharge, waiting for transport and discharge medication and poor or inadequate discharge planning with lack of communication and co-ordination of discharge deadlines. Clearly, there will also be external factors that delay discharge including lack of facilities for residential or nursing care, waiting for funding from social services and so on. An important factor to reduce delays in discharge and ensure that the discharge is effective and efficient is having effective communication (Gonçalves-Bradley et al, 2016).

1.4 Completion of the discharge summary

In the United Kingdom (UK) the preparation of a discharge summary is primarily the responsibility of junior doctors. In 2009 a UK study reported that 90% of all discharge summary items were written by doctors in their first and second Foundation Years (FY) of training (Dornan et al, 2009). This is in the context that the hospital consultant has overall responsibility for the care of the patient and the content of the discharge summary. In practice this will rarely be checked by the consultant at the point of discharge. However, a pharmacist usually carries out a final check or verification of the discharge prescription (Abdel-Qader et al, 2010).

1.5 Types of hospital discharge

It is recognised that there are two main types of discharge from hospital. Most patients, about 80%, will be discharged after having a relatively straightforward discharge plan in place. This will typically be for patients who are going home and have simple on-going care. This is known as simple discharge. The remaining 20% of patients who may be over the age of 65 years old will have more complex needs. The discharge plan may need support from other health and social care workers and more specialist knowledge is needed for effective discharge.

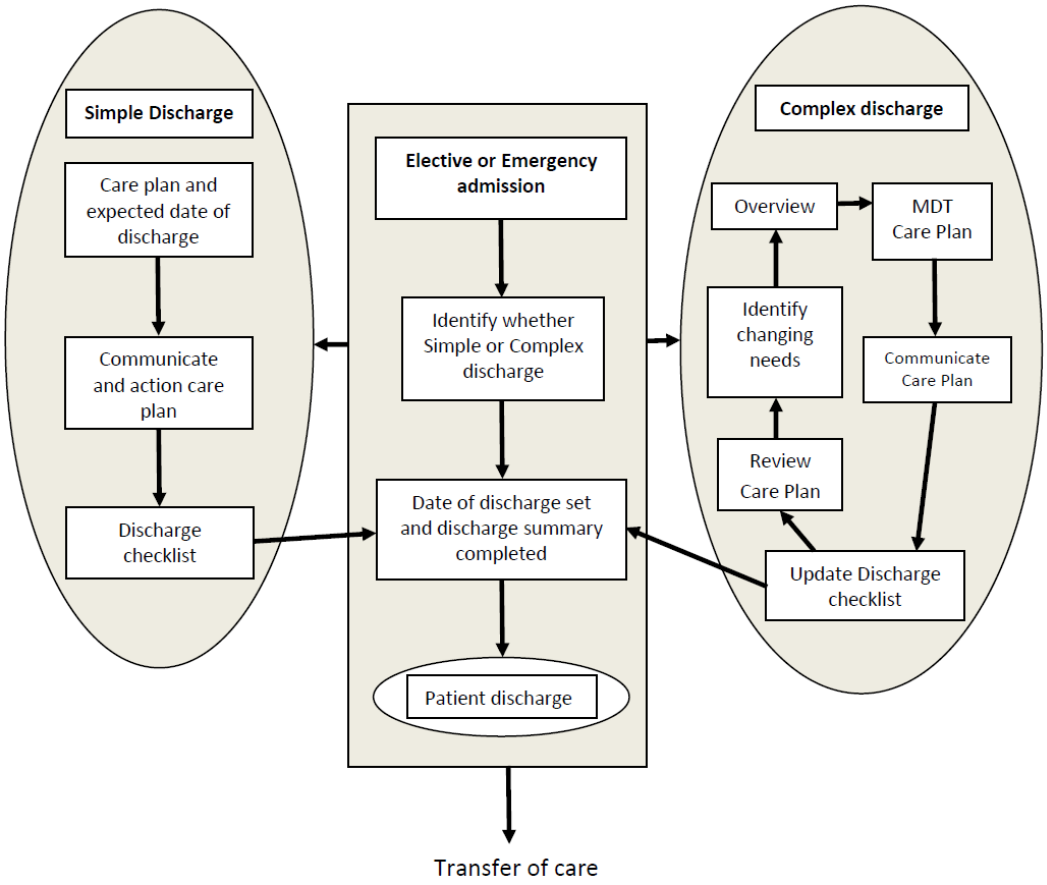

Figure 1: The discharge and transfer planning processes for simple and complex discharges

Figure 1 shows the distinction in the pathway for a patient for the discharge and transfer planning process for both emergency and elective admissions dependent upon whether the discharge is complex or simple (adapted from Department of Health, 2010).

There may be an implication on the type of discharge on the quality of discharge information in relation to the medication as patients with a complex discharge are more likely to be on more medicines, to have more changes to the medicines and been in hospital for a longer time. Failure to follow the established best practice may result in unsafe patient discharge or delays in the transfer of care and this was identified in a recent report from the House of Commons (2016).

The human costs of poorly planned discharge have been grouped into four key themes:

- Patients discharged before they are clinically ready, resulting in emergency readmission and/or potentially avoidable death;
- Patients discharged when they are clinically ready but without assessments and adequate support in place which result in emergency readmission and additional health problems;
- Relatives and carers not being consulted in care planning; and
- Patients who are medically fit but having to stay in hospital which can result in worsening health.

One of the clear findings of the House of Commons report (2016) is that best practice guidance in patient discharge is not consistently implemented across healthcare providers. In 2015 NICE published a clinical guideline 'Transition between inpatient hospital settings and community or care home settings for adults with social care needs' (NICE, 2015a). This guideline provides best practice guidance to optimise the transfer of care or transition on discharge. The overarching principles again include providing person centred care, having effective communication and sharing information. This includes providing information on medication which is communicated on the discharge summary. It is, therefore, important that the format and content of a discharge summary is carefully considered to allow inclusion of all the necessary medication-related information to the next care provider and patient.

1.6 Medicines Optimisation and Elderly People

An important component of discharge for elderly patients is to optimise the use of medicines. Medicines Optimisation aims to improve medicines use and has been defined as requiring *"evidence-informed decision-making about medicines, involving effective patient engagement and professional collaboration to provide an individualised, person centred approach to medicines use within the available resources."* (Shah et al, 2014). The decision and process of prescribing may be complex. It will include the decision as to whether a medication is indicated, which agent to choose depending upon factors such as the patient's condition, safety profile and cost. The dose will then need to be chosen and dosing schedule appropriate for the patient's condition. Once prescribed the medication will need to be dispensed and the patient informed how to use the medication

to ensure maximum benefit. The effectiveness and toxicity of the medication will need to be monitored and follow-up of any issues if necessary. Prescribing for an elderly patient therefore provides further challenges. Medicines are often not assessed in clinical trials in elderly patients and so the pharmacokinetic and pharmacodynamic profile of the medicine may not be known when first licensed for use. Also, elderly patients are likely to have impaired ability to handle certain drugs for example impaired renal function reducing drug clearance or age-related decline in liver function which may affect variability on liver metabolism. Elderly patients will often have multiple medicines prescribed - so-called polypharmacy.

Polypharmacy is not necessarily wrong but if medicines are prescribed that are no longer appropriate then this can lead to problems. The consequences of polypharmacy can mean that it puts an individual at increased risk of harm, contribute to hospital readmissions and poor therapeutic outcomes (Pirmohamed et al*,* 2004; Kongkaew et al*,* 2013). The elderly may be at increased risk of readmission due to an Adverse Drug Reaction (ADR), with 5% of 380 matched control elderly patients over the age of 65 readmitted as an emergency admission within 28 days due to an ADR compared with 1.6% in a control group in Hong Kong (Chu and Pei, 1999). Also, there is a risk of poor adherence in the elderly and it has also been found that in some cases that 50% of patients do not take their medicines as prescribed (Nunes et al*,* 2009; Marinker and Shaw, 2003). So, the risk of medicines not being taken as prescribed is increased following discharge from hospital when new medicines have been prescribed. If the discharge summary is inaccurate this may compound the problem.

Policies have been developed at national level to improve services to elderly people. In 2001 the UK National Service Framework for Older People was published providing some standards for care (Department of Health, 2000a) including a supporting document to the National Service Framework about the safe and effective use of medicines (Department of Health, 2001b). This document focused on how medicine use could be improved for elderly patients which included having timely and effective discharge procedures. A recommendation was made to provide full information to GPs and patients on medication at discharge including reasons why any changes that had been made. Despite this, there was no clear statement to ensure that the transfer of care of an elderly patient is carried out accurately in a timely manner with an emphasis on the quality of the discharge summary.

Knight et al, (2013) carried out a small qualitative study of 19 individuals over 75 years old taking four or more medicines following discharge from hospital in the UK. Seventeen of the 19 elderly people in the study had some of their medications changed during their hospital stay. The study clearly identified the need to involve the patient or carer more in the discharge process. They found that patients would value clear and concise lists of prescribed medicines much like that which is contained within the discharge summary.

1.6.1 Transition of care for elderly people

Transfer of care takes place when responsibility for a patient's care is passed from one professional, agency and/or location to another as their health and care needs change (Oboh, 2016). Transition mainly occurs on the discharge from a hospital to community setting but can also occur during patient transfer between wards, to an intermediate care unit, back home and from the community into a hospital or care home. Frail elderly patients are considered in this thesis as: they occupy 62% of hospital bed days in 2014-15 (NAO, 2016), are often discharged into the community on more than one occasion, and take more medicines (Scholes et al, 2013). The proportion of people aged 65 and over who were dispensed 10 or more medicines increased from 4.9% in 1995 to 17.2% in 2010 (Wimmer et al, 2016). This is important as complex medication regimens and polypharmacy in elderly patients may be predictors of mortality (Wimmer et al, 2016).

1.7 Consequences of poor discharge

A successful discharge for a patient will be measured by positive health outcomes, absence of readmission and the effectiveness of the communication of information to the next place of transition of care. This information includes communication with the patient's GP to facilitate ongoing management of the patient. This is often the time, especially after an emergency admission, that changes have been made to the patient's medication regimen and therefore medication-related incidents can occur. It has been estimated from a national patient safety alert that there were in the region of 10,000 reports made to the National Reporting and Learning System (NRLS) of patient safety incidents related to patient discharge from hospital each year (NHS England, 2014). This was in part recognition of the complexity and multi-factorial nature when patients are transferred from either secondary care to primary, community or social care. An issue identified was the risk at the point of transition of care of inadequate communication and

information. In fact, poor communication accounted for 33% of the patient safety incidents reported. It was identified that patients require high quality and timely transfer of essential information to reduce readmission and to have discharge medicines reconciliation (DMR) in place. In the period 2003 to 2004 it was found that 19.6% of patients were readmitted to hospital within 30 days of discharge and 34% within 90 days of discharge in the United States of America (USA). It was estimated that 10% of the readmissions were planned and the costs to the healthcare system significant (Jencks et al, 2009).

In the UK, the CQC undertook a national study about managing patients' medicines after discharge from hospital (CQC, 2009). Two hundred and fifty GP practices were studied and only 27% reported the discharge summaries are "hardly ever" or "never" inaccurate or incomplete. One of the main inaccuracies reported related to medicines that had been prescribed when the patient was discharged. A total of 81% of practices reported that details of prescribed medicines were incomplete or inaccurate on discharge summaries "all of the time" or "most of the time". The implications are that a patient could be readmitted due to a failure to identify ADEs, medication non-adherence and medication discrepancies.

In 2015 Healthwatch in England published a report 'Safely Home: what happens when people leave hospital and care settings' (Healthwatch, 2015). The report related to the experience of over 3,200 people about their discharge and found that there were often delays and a lack of co-ordination between different services.

One of the basic failings was of hospital staff not passing on details about medication to GPs.

Hesselink et al, (2013) meanwhile examined the experiences and perceptions of patients, relatives and care providers at discharge based on one university and a related community care facility in the Netherlands about good handover. The key finding was that continuity of care at discharge was not guaranteed. Three main reasons for this were highlighted: the quality of information exchange; the coordination of care; and communication between hospital and community care providers. Importantly hospital healthcare professionals were often unacquainted with the care provision in the community and the requirements for community staff in caring for patients after discharge. Poor information

about medication was highlighted in the study. This study provides a valuable insight into the need to consider not only the hospital information requirements but also those in the community which may be different. A mutual understanding is required to appreciate the differing priorities at the point of transition of care and should be considered when designing a good quality discharge template and process.

1.7.1 Adverse Drug Events (ADE) after discharge from hospital

One of the consequences following hospital discharge is that the patient may suffer an ADE. At the point of discharge there may be significant changes in medication that has been stopped, started or changed. This is a time of high risk of discrepancies and poor communication in the provision of medication-related information (MRI). It has been estimated that between 19% and 23% of patients suffer an ADE after discharge (Forster et al, 2003; Forster et al, 2004). Forster and colleagues (2004) carried out a prospective study across a multi-site tertiary teaching hospital in Canada. 327 patients with an average age of 71 were assessed for the incidence, severity, preventability and ameliorability of adverse events when discharged with 23% of patients experiencing an adverse event. The severity ranged from symptoms only in 65% of adverse events, to permanent disability in 3% and death in a further 3%. The most common adverse events were medication-related (72%), with 6% experiencing preventable adverse events and 5% an ameliorable adverse event. It was felt that the best method to reduce the likelihood of an ADE was to improve monitoring for medication side-effects after discharge, particularly in frail patients. One method to overcome this was to improve communication with community care providers although there was no description on how this would be undertaken in practice. Also, a small pilot retrospective observational study of 43 patients, followed up after hospital discharge, was carried out in an academic family medicine outpatient clinic by a pharmacist in the USA. It found that 2.9 ADEs or preventable ADEs were identified in the cohort per patient. The most common types of ADEs were non-adherence or underuse of medication (18%) and lack of therapeutic monitoring (13%) of medication. It was felt that the lack of a complete and accurate medication list at hospital discharge was an issue to optimise medicines use (Armor et al, 2016).

1.7.2 Medication discrepancies on discharge from hospital

A low-quality discharge summary may influence the occurrence of medication discrepancies post-discharge. Wong et al, (2008) carried out a study in a tertiary care teaching hospital in Canada of 150 discharged patients. They found that 106 (70.7%) patients had at least one unintentional medication discrepancy and a third of these had the potential to adversely affect patient safety. The factors which influence discharge summary information include those that may be system related such as the design or template of the discharge summary content, whether the document used to transfer information is handwritten or electronic, the time available to document and communicate information, and whether the admission was planned or an emergency.

At discharge there are reasons why the pre-admission medication may be different to those prescribed on discharge. It is important to consider these reasons to try and reduce the likelihood of any discrepancies or omissions being continued after discharge. The patient journey in relation to the review and prescribing of medication can provide a useful insight into how these discrepancies can occur and is shown in Figure 2.

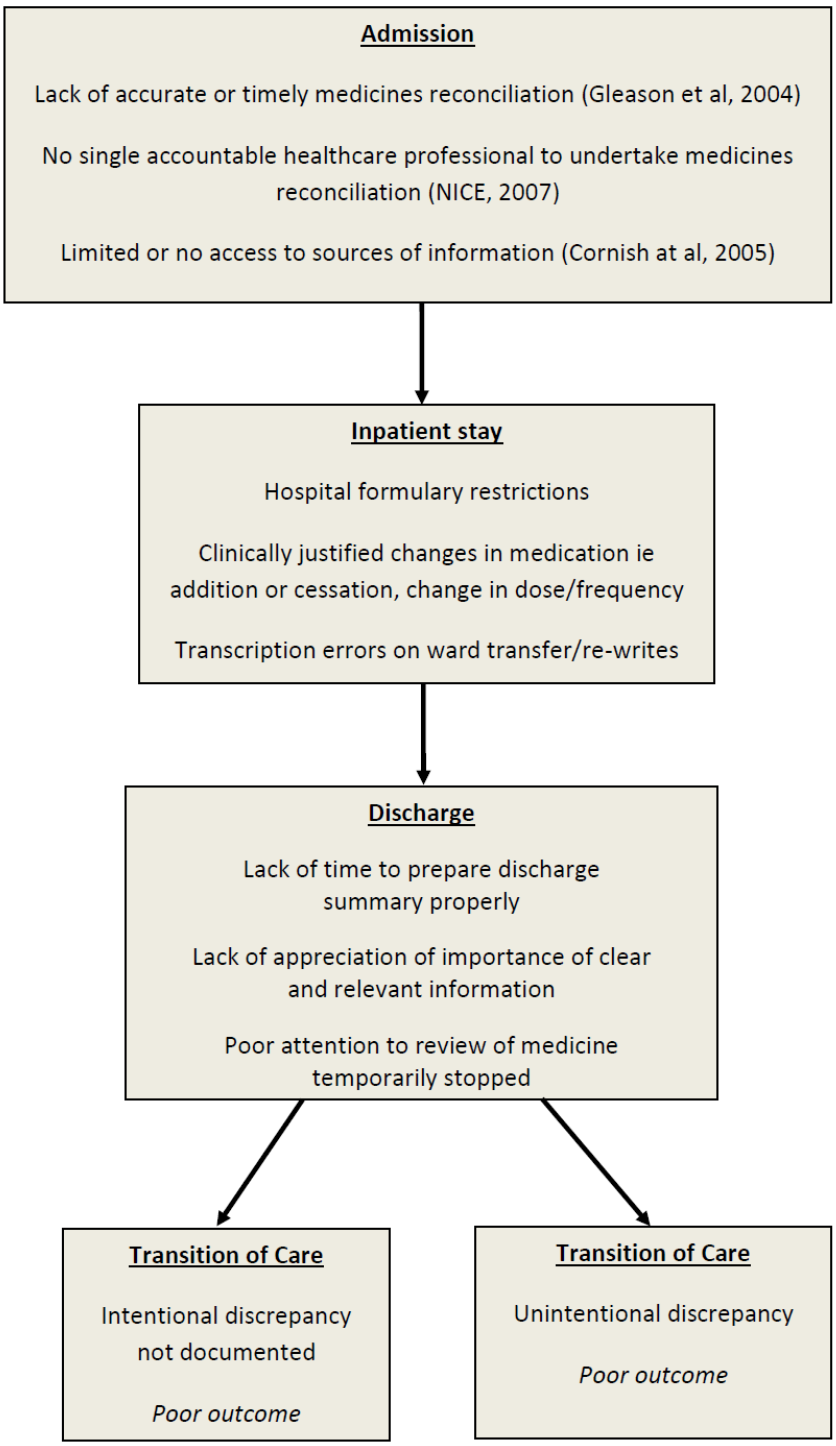

Figure 2: The journey for a patient following admission showing where medication discrepancies may occur and their potential outcome

Figure 2 shows the journey of a patient following admission, showing the points where there may be an intentional or unintentional difference between pre-admission medication and discharge medication leading to poor outcome to the patient eg medication-related harm.

On admission there may not be a comprehensive and accurate medication history undertaken - the so-called Admission Medicines Reconciliation (AMR). There may be time constraints, patient language or health reasons, healthcare staff lacking medication-history competency skills and so on. There may be poor or limited access to sources of medication history information such as GP records, patients own medicines and community pharmacy records. Often multiple healthcare professionals may, at various levels, undertake a medication-history and obtain conflicting information leading to discrepancies with no one single accountable person taking the lead. During the inpatient episode of care there may be several changes to the patient's medication regimen based on their health status and requirements. The hospital may have its own prescribing formulary with a limited choice of medicines available. This may force a change in the patient's medication regimen. Finally, at the point of discharge the medication prescribed or described on the discharge summary should be done in a careful and considered manner. Medicines may have been withheld or substituted for valid clinical reasons during the inpatient episode but may need to be restarted on discharge eg a diuretic that was stopped due to dehydration on admission, which has now resolved, but may need to be restarted again to control the symptoms of congestive cardiac failure (Kripalani et al, 2007a). These issues can lead to a medication discrepancy on discharge. In 1996 these discrepancies were classified in prescribing as either 'intentional' or 'unintentional'. Unintentional discrepancies may be due to a breakdown in communication across the care setting whereas an intentional discrepancy is one that has been considered and not due to a process or communication failure (Duggan et al, 1996). It is important to note that both types need to be carefully considered as even an intentional discrepancy poorly communicated can still lead to an ADE.

Coleman et al, (2005) undertook an evaluation of post-hospital medication discrepancies based in a community hospital setting in USA. A total of 375 study patients were reviewed who were over 65 years of age. They found that 53 (14.1%) study patients experienced one or more medication discrepancies. Of these 53 study patients 62% experienced a single discrepancy and 25% experienced two discrepancies with a mean number of 1.6 discrepancies. Interestingly, patients who experienced a discrepancy had more medications (mean number of medications, nine) compared with those who did not (mean number of medications, seven). Also, patients who had congestive heart failure were significantly more likely to be associated with having a medication discrepancy. A total of 14.3% of the patients who experienced medication discrepancy were readmitted

at 30 days compared with 6.1% who did not experience a medication discrepancy. It is not stated if these readmissions were due to medication or just a causal relationship.

In a separate study from a teaching hospital in New Zealand, an audit of written discharge summaries for 100 medical and 100 surgical patients discharged from hospital was carried out (McMillan et al, 2006). The mean length of stay for both patient types was about seven days. The medical patients were more likely to have changes to their medications during the admission (1.70 medicines 95% CI 0.38-0.80) compared with surgical patients (0.59 medicines 95% CI 7.40-8.64). There were 0.81 (95% CI 0.65-1.02) errors per surgical patient summary and 1.42 (95% CI 1.20-1.67) errors per medical summary. The most common error was the failure to list one or more of the medicines that the patient was taking. A consensus panel was convened of doctors and a pharmacist to grade the severity of the error. Most of the errors, 87.4%, were minor or potentially troublesome whereas 1.8% had a potential to cause readmission.

A retrospective review of medication-information on discharge summaries found that most discrepancies originated at discharge and not earlier in the inpatient stay (Michaelson et al, 2017).

The implications of failure to list a medicine and give a reason on the discharge summary include the patient and the GP believing that a medicine has been stopped when it has not. Also, if a medicine is intentionally stopped on admission but this is not clear on the discharge summary and the GP restarts the medication because they believe it has been unintentionally omitted from the discharge summary. In 2012 a Belgian study investigated discrepancies in medication-information on discharge for patients 65 years old or older. Of 189 discharged patients 47.6% (90) had one or more discrepancies in medication information at discharge. In this study 41.9% of the discrepancies had the potential to cause moderate harm. They recommended that patients prescribed more than five medicines at discharge should be prioritised to prevent discrepancies (Cornu et al, 2012). Whereas Miller et al, (2000) developed a hospital readmissions predictive model that identified that elderly people taking four or more medicines have an increased risk of suffering a hospital readmission. There are therefore specific risks if the communication about medication at discharge is not effective and timely for elderly patients on multiple medicines.

Grimes et al, (2011) carried out a study in Ireland to investigate the factors contributing to medicines reconciliation on discharge and to identify the prevalence of non-reconciliation. This was a cross-sectional observational survey using consecutive discharges from purposively selected services in two acute hospitals in Ireland. Of the study population 9,569 medication orders for 1,245 episodes of care were surveyed. 55% were male and 77% were under a medical team. The median age was 62 years old. The highest discharge day was on a Friday (24%) and the least on a Sunday (3%) with the median length of stay of seven days. The median number of medicines was six with 70% of patients on discharge experiencing polypharmacy. They found that medication details documented at discharge frequently had prescribing writing errors or failed to communicate information regarding changes made during inpatient care. For example, of 1,245 discharge summaries, 268 (21.5%) did not communicate that a medication had been stopped, 233 (18.7%) omitted an active medication at discharge, and 140 (11.2%) omitted a preadmission medicine. This was also the first study to provide evidence of the association between medication type and non-reconciliation. There was a greater tendency for omission on discharge of endocrine, central nervous system, nutrition and blood and 'other 'medicines whilst those patients discharged using a handwritten discharge summary were more likely to experience non-reconciliation.

1.8 Quality improvement initiatives to reduce hospital readmission

The high rate of hospital readmissions related to ADEs and medication discrepancies has promoted the adoption of quality improvement initiatives to reduce the likelihood of readmission. An important guide to reduce risk and readmission in relation to medicines was produced in 2005 called 'Moving patients safely' produced by the Royal Pharmaceutical Society (RPS) of Great Britain in collaboration with the Guild of Hospital Pharmacists, The Pharmaceutical Services Negotiating Committee and the Primary Care Pharmacy Association (RPS, 2005).

This extensive resource noted that medicines that patients received at discharge fell into several broad groups, namely:

1. Regular medicines started before the hospital admission.
2. Replacement of regular medicines because of changes to routine prescription whilst in hospital and additional regular medicines, that is, those that have been

added during the hospital stay and will be required as an ongoing treatment on discharge.

3. Short term medicines directly related to their hospital stay eg antibiotics, pain relief medication and not required for long term use.

The guidance recommended that protocols should be in place to ensure that information received at discharge be handled in a way that ensures it is acted upon in an appropriate manner by the GP (or the community pharmacy). However, in terms of the quality of information related to medicines, the only recommendation to communicate to the GP was related to justifying medication changes on discharge including omission, addition and rationalisation.

Mandatory documentation for medication-information at discharge is an initiative that has been introduced in the USA by the Joint Commission on Accreditation of Healthcare Organisations (JCAHO). A medication reconciliation process that requires a patient's discharge medication to be compared with previous home medicines and differences reconciled should be carried out and a discharge summary completed within 30 days (Sentinel Event Alert, 2006). Despite these initiatives there has been a paucity of evidence about the relationship or benefits between such mandatory requirements and readmission. Data from patients discharged from hospitals in the USA in 2007 that examined hospital performance on two measures of discharge planning namely: the adequacy of documentation on the chart that discharge instructions were provided to patients with congestive heart failure and patient-reported experiences with discharge planning and readmission with congestive heart failure and pneumonia found no or little association with readmission (Jha et al, 2009).

A systematic review in 2007 attempted to identify the types and prevalence of deficiencies in relation to communication and information transfer between the hospital and the primary care physician as well as the efficacy of interventions undertaken to improve this process (Kripalani et al, 2007b). They found that there were deficits in communication and information transfer at hospital discharge which adversely affected patient care with between 2% and 40% of medicines omitted from the discharge summary. Interventions such as the use of computer-generated summaries and standardised formats may improve timely transfer of information to the care provider on discharge. A recommendation was made to include details of the reconciled discharge

medication regimen with reasons for both any changes made and the indications for newly prescribed medications. A further study in the USA was undertaken to consider the effectiveness of different components of the discharge process including medicines on reducing hospital readmission. This was a case-control study of 1,039 patients who had experienced readmission within 30 days of discharge and 981 non-hospitalised patients who were matched for admission diagnosis and severity of illness amongst others in 34 hospitals (Hansen et al, 2011). The study failed to identify any relationship between readmission and most of the components of the discharge process. This included no association between readmission and documentation of medication reconciliation. There was a small (2%) increase in readmission risk for each additional medication present upon discharge while accounting for severity of illness. A potential reason for the lack of correlation with mandatory discharge processes and readmission within 30 days is that the quality of discharge may have been poor despite documented as being complete. However, despite the paucity of strong outcome data the adoption of medicines reconciliation processes has continued in the USA (Kripalani et al, 2007a).

1.8.1 Standardised discharge summaries

To improve the quality of discharge communication and information it is important to measure or audit practice against standards. Standards for discharge have been described previously and many nationally recognised resources have been advocated for adoption. Recently an audit of discharges was carried out using the National Prescribing Centre (NPC) minimum dataset standards for discharge published in 2008 (Hammad et al, 2014). The audit was undertaken in the UK of 3,444 discharge summaries received by medical practices of patients who had been hospitalised for 24 hours or longer. Patients had been discharged from two teaching hospitals and three district hospitals. Unplanned admissions accounted for 63% of the audit sample and 74.6% of discharge summaries were electronic. The median patient age was 66 with patients on a median number of medicines of five (range 2-8) and four days' median length of stay. The mean (95% CI) discharge summary adherence to the NPC minimum dataset was 71.7%. Electronic discharge summaries demonstrated higher adherence than handwritten summaries. Discharge summary information of therapy that had been changed gave the lowest adherence of 48.9%. The rationale for medicines initiated, discontinued or changed was persistently omitted. Interestingly there was a considerable variation between hospitals in adherence with the minimum dataset. This suggested that the use of a standardised

discharge summary may provide better quality discharge information as recommended in the national contract to avoid variation in the type of information given to primary care (NHS England, 2017). A main limitation of this worthwhile study was that the NPC minimum dataset standards were not mandatory. There was therefore no mandate for hospitals to adhere to the guidance.

More recently Shah et al, (2016) have carried out a collaborative audit across England on the quality of discharge medication-related information provided when transferring patients from secondary care to primary care. The audit standards were based upon those published by the Royal Pharmaceutical Society (RPS, 2012) and the Academy of Medical Royal Colleges medicine records on discharge (HSCIC, 2013). 1,454 discharge summaries were audited with 10,038 medicines prescribed across all discharge summaries which involved 159 hospitals. The median age of patients was 72 years old and 47% were male. The median length of inpatient stay was four days and 78.6% patients had an unplanned admission to hospital. Allergy status documentation was identified as a high priority indicator of the quality of the discharge summary due to the recent NICE guidance published on drug allergy (NICE, 2014). In terms of adherence to the RPS standards there was variability in the results obtained. Only 11.7% of the prescriptions had the indication stated on the discharge summary whilst 60.3% and 72.5% had formulation and instruction of on-going use/supply stated respectively. These results may have reflected lack of consistency with the discharge templates used. Only 49% of medicines had a reason documented of why the medication had been commenced although some of this may, in part, have been because the medicine commenced did not need to be continued by the GP. Similarly, only 57% of medicines had a reason documented of why the medicine was being stopped. The study also identified that 1,565 medicines were omitted which equates to a mean of 1.1 medicines omitted per discharge summary which may indicate poor or lack of medicines reconciliation on admission. Of 477 medicines that had a dose change, only 39% had a reason documented of why the dose had changed. Interestingly only 49% of the discharge summaries had been screened by a pharmacist and 72% were delivered to the GP electronically.

1.8.2 Method of transmission of discharge summaries

The method and mode of transmission of the discharge summary may play a role in determining the quality and safety of the transition of care. There has been a move

towards the adoption of either producing an electronic discharge summary as a standalone document or via a hospital electronic prescribing and medicines administration (HEPMA) system in part to reduce medication discrepancies and improve the quality and timeliness of discharge information.

Mills et al, (2016) undertook a narrative literature review of hospital discharge information and prescribing errors primarily on HEPMA or other electronic implementation schemes from 2000 to 2014. The review focused on the UK and other similar healthcare systems including Australia, Canada, Ireland and New Zealand. Fifteen studies were reviewed and composed of eight studies from the UK, five from Australia, one from New Zealand and one from Ireland. Many study designs and methods were used with the predominant type being a retrospective study in nine cases and six surveys. The review split the studies found into three groups to allow comparison and demonstrate the evolution of the discharge communication method over time. Six studies investigated a handwritten, paper communication system. Medicine information errors were found to be reported in up to 66% cases on discharge. Four studies compared handwritten with electronic discharge summaries and had variable results. Two studies found that if an electronic discharge was employed there was an improvement in compliance with information documentation of up to 82%, whereas the other studies found that there was an average error rate of 1.5 errors per patient with paper compared with 1.4 with electronic discharge summaries. Finally, five studies evaluated electronic discharge summaries and found that electronic systems had an error rate of 8.4% of prescribed items. The review highlighted the lack of literature that evaluates the HEPMA systems impact on communication of discharge information. In a further study by the same authors they found that the implementation of HEPMA improved hospital staff views of patient safety improvement initiatives (Mills et al, 2017a).

1.8.3 Other factors

The quality of the discharge summary may also be affected by other factors such as: whether a pharmacist was involved in the production and verification of the discharge summary, the extent of training and competency of the prescriber, the complexity of the discharge and the discharge medication. These factors will be explored in more detail in subsequent chapters.

1.8.4 Structured discharge care plans and Medicines Reconciliation

Key initiatives to reduce the consequences of poor quality discharge related to medicines include the use of structured care plans and medicines reconciliation. In Sweden, Bergkvist et al (2009) studied elderly patients (65 years or over) discharged from hospital where pharmacists had created a systematic medication care plan for each patient that was continually updated during the inpatient episode. When the doctor completed the discharge summary, including the medication list, the pharmacist evaluated the document according to a checklist utilising the care plan and other records. Any information that was omitted or incorrect was discussed with the doctor prior to discharge. In so doing there were on average 45% fewer medication errors per patient on discharge and so improved the quality of transition of care. In Germany the use of a structured medication report as part of the discharge summary improved adherence in stroke patients to hospital discharge medication (Hohmann et al, 2014). Similarly, Midlöv et al, (2008) found that the use of a medication report reduced the number of medication errors when elderly patients were discharged from hospital in Sweden.

Moreover, in many countries including the USA and England the process of medicines reconciliation has been advocated as a quality improvement measure to decrease medication errors on discharge and improve transition of care (Sentinel Event Alert, 2006; NICE - Clinical Guideline 5, 2015b). The process of medicines reconciliation (MR) has been defined by the Institute for Healthcare Improvement (IHI) as the process of identifying an accurate list of a patient's current medicines and comparing them with the list in use in the admission, transfer and/or discharge process, recognising any discrepancies and documenting any changes thereby resulting in a complete list of medicines accurately documented (IHI, 2017).

MR can, therefore, be carried out at different points in a patient's journey (NICE, 2015b):

- In an acute setting - ideally within 24 hours or sooner of admission to hospital.
- On transfer between wards - this may be necessary for patients on complex regimens and/or when new drug charts are re-written.
- In primary care - medicines reconciliation should be carried out for all people who have been discharged from hospital. This should occur as soon as possible after discharge and ideally before a new prescription or new supply of medicines is issued, and, within one week of the GP practice receiving the information.

The process or service of carrying out MR is now considered to be a key performance indicator for chief pharmacists in hospitals in England as part of increasing the patient facing activity of pharmacy staff and to improve patient safety (Carter, 2016). Hitherto the focus for pharmacy services in the UK has been on undertaking MR at admission to hospital, ideally within 24 hours of admission (Dodds, 2014). However, increasingly there is a need to have more robust and systematic processes to ensure MR is undertaken not only during admission, inter-ward transfer but also after discharge from hospital - so-called discharge medicines reconciliation (DMR). When patients transition from hospital to primary care the medication regimen often changes either intentionally or unintentionally. There is a risk of some patients being affected and so it is mandated in the USA (Sentinel Event Alert, 2006) and in Canada (Accreditation Canada, 2010). Interestingly in Canada part of the mandate includes process and evidence that two lists are compared of medicines listed prior to transfer with the list of new medication ordered at transfer. Also, that any differences have been identified, discussed and resolved. The actual evidence base for the effectiveness of MR alone is not strong. A systematic review by Kwan et al, (2013) of 18 studies found that most unintentional medication discrepancies had no clinical significance and critically that MR alone probably does not reduce post discharge hospital readmission. One of the reasons postulated for this was that many studies have not considered the long-term outcome of MR greater than 30 days post-discharge. What is clear, however, is that pharmacists play a pivotal role in the MR studies to reduce risks (Kwan et al, 2013).

Chhabra et al, (2012) also undertook a systematic review of studies evaluating MR interventions in patients transferred to and from long-term care settings. Despite this being the focus of the review there was limited evidence of the value of MR as an intervention as the studies included in the review had flaws - although there was still evidence of the value of input of a pharmacist in the process.

A primary care perspective of the value of MR after discharge was described by Avery et al, (2012). This study investigated the prevalence and causes of prescribing errors in general practice the so-called 'PRACtiCE study' (Prevalence and Causes of prescribing errors on general practice). In sub-analysis thirty-seven patients who had at least one hospital discharge during a 12-month retrospective review of their medical records from different areas in England were identified. 56.8% patients were female; the median number of medicines on discharge was seven. In 36 (97%) patients there was a difference

between the medications the patient was taking before admission and those listed on the discharge summary. The median number of days it took the GP practice to record on the practice computer the medications the patient was taking at the time of discharge was less than one day. Of greater concern was that for 92% (80/87) of newly prescribed medicines in hospital the discharge communication did not specifically highlight medicines that had been newly prescribed and there were no cases where the discharge communication specifically highlighted changes in dose for medicines that patients were taking before admission. Of 87 medicines newly prescribed by the hospital, 24 (28%) were either not continued or there was some discrepancy between the prescribing advice of the hospital and the subsequent prescription. Of 26 medicines that patients were taking before hospital admission where the hospital suggested a change in dose, this designated dose change was not made by the GP practice in nine (35%) of cases. Interestingly, a few GPs identified a need for any medication change to be made immediately obvious to them eg highlighted in bold type or in capital letters or clearly marked. There was clearly a lack of effective integration of information on the hospital discharge summary and input into the GP practice prescribing record system.

1.8.5 Format and content of a discharge summary

The current NHS standard contract service conditions state that the provider ie hospital must comply with the transfer of and discharge from care protocols (NHS England, 2017). This means that the hospital must, within 24 hours following the transfer or discharge, issue a discharge summary to the patient's GP using an applicable delivery method. There is guidance where a patient has a clinical need for medication to be supplied on discharge that the patient has an adequate quantity of that medication to last for the period required by local practice and protocols (but at least seven days) or for a shorter period whichever is clinically appropriate. The national NHS contract does not specify the content of a discharge summary. However, it does recommend using or being consistent with clinical headings recommended by the Health and Social Care Information Centre (HSCIC) and more recently the Professional Records Standards Body (PRSB) and Academy of Medical Royal Colleges (HSCIC, 2013; PRSB, 2017).

The format of the discharge summary has historically been a document that has been implemented locally. The function of the discharge summary is to provide the GP with an accurate narrative of the patient's episode of care. The GP (or next care provider) will

invariably rely on the discharge summary documenting any changes in the patient's regular medication regimen. Additionally, information will be included on what has happened during the patient's stay and what is recommended or expected once they have been discharged.

The recently published PRSB standards (PRSB, 2017) are based on those previously recommended by the Health and Social Care Information Centre and Academy of Medical Royal Colleges published in 2013. These standards for the clinical structure and content of patient records are a wide-reaching resource that covers standards for patient records such as hospital referral letters, inpatient clerking, handover communications, discharge summaries and outpatient letters. The standards were published after a review of evidence and consultation with relevant stakeholders including doctors, patients, nurses and allied healthcare professionals. The standards consist of a list of clinical record headings and a description of the information that should be recorded under each heading. The discharge record or summary headings is comprehensive and detailed to include details such as: GP practice, referral details, patient demographics, social context, special requirements, admission details, discharge details, clinical details, procedures, clinical summary, safety alerts, medication and medical devices, allergies and adverse reaction details, investigations and procedures requested, patient and carer concerns, information and advice given, plans and requested actions, person completing record and distribution list.

The elements and description for some of the medications, medical devices, allergies and adverse reactions sections are shown in Table 2 (PRSB, 2017).

Table 2: Selected Elements for the standards for discharge

Medications and medical devices	
Element	**Clinical description**
Medication name	May be generic name or brand name (as appropriate).
Medication form	eg capsule, drops, tablet, lotion etc.
Route	Medication administration description (oral, IM, IV, etc): may include method of administration (eg by infusion, via nebuliser, via NG tube) and/or site of use (eg 'to wound', 'to left eye', etc).
Dose	This is a record of the total amount of the active ingredient(s) to be given at each administration. It should include, eg units of measurement, number of tablets, volume/concentration of liquid, number of drops, etc.
Medication frequency	Frequency of taking or administration of the therapeutic agent or medication.
Element	**Clinical description**
Additional instructions	Allows for: • requirements for adherence support, eg compliance aids, prompts and packaging requirements • additional information about specific medicines, eg where specific brand required • patient requirements, eg unable to swallow tablets.
Course status	Details of the overall course of medication
Indication for medication	Reason for medication being prescribed, where known.
Medication recommendations	Suggestions about duration and/or review, ongoing monitoring requirements, advice recommendations on starting, discontinuing or changing medication.
Medication discontinued	The name of the medication to be discontinued.
Reason for medication change	Reason for change in medication, eg sub-therapeutic dose, patient intolerant.
Medical devices	The record of dietary supplements, dressings and equipment that the patient is currently taking or using.

Allergies and adverse reaction	
Element	**Clinical description**
Causative agent	The agent such as food, drug or substances that has caused or may cause an allergy, intolerance or adverse reaction in this patient.
Description of the reaction	A description of the manifestation of the allergic or adverse reaction experienced by the patient. This may include: • manifestation, eg skin rash • type of reaction (allergic, adverse, intolerance) • severity of the reaction • certainty • evidence (eg results of investigations).

However, in addition to this, other organisations have published their own guidance or recommendations, particularly in relation to the details about medication on discharge. In 2012 the Royal Pharmaceutical Society published the final good practice guidance for healthcare professions related to the medication component of the discharge or transfer process called 'Keeping patients safe when they transfer between care providers - getting the medicines right' (RPS, 2012). This guidance was also endorsed by the Academy of Medical Royal Colleges, Royal College of General Practitioners, Royal College of Nursing and Royal College of Physicians. Core principles have been laid out to support the safe transfer of information about medicines whenever a patient transfers care provider. The four core principles are that:

1. Healthcare professionals transferring a patient should ensure that all the necessary information about the patient's medication is accurately recorded and transferred with the patient and that responsibility for on-going prescribing is clear.
2. When taking over the care of a patient there should be a check that information about the patient's medication has been accurately received, recorded and acted upon.
3. Patients should be encouraged to be active partners in managing their own medicines.
4. Information should be communicated in a way that is timely, clear, and unambiguous and ideally generated and/or transmitted electronically.

The recommended core content of records for medicines when patients transfer care providers is broadly consistent with the PRSB for medical records on discharge. In Scotland, the Scottish Intercollegiate Guidelines Network (SIGN) published a minimum dataset standard for the immediate discharge summary in 1996. This was subsequently revised and updated in 2003. It was recognised that with the development of electronic documents and the increasing use of MR processes that a further revision was needed and was put in place in 2012 (SIGN, 2012).

A similar resource for defining a national standard for patient discharge summary information was published from Ireland. The Health Information and Quality Authority (HIQA) published a standard in 2013 (HIQA, 2013). The scope of the standard provides a full picture for the patient's GP of the inpatient stay including patient details, admission and discharge details, clinical course during the inpatient stay, changes to medication including a full list of medication, treatment plan and discharging details. The standard was developed by the Health Standards Advisory Group and other stakeholders. A study that considered adherence with this standard for discharge was that carried out by Aziz et al, (2016). A retrospective audit of 198 randomly selected discharge summaries was conducted at a single hospital in Ireland. The median age of inpatients was 63 years old with 50.3% male. The mean number of medicines per patient at discharge was 8.9. A total of 1,683 medications were prescribed at discharge from both medical and surgical patients. Variable results were observed with adherence to the standard. Only 17.7% had a documented change on the discharge summary with overall compliance with all medication criteria only 18.9%. The generic drug name used (40.2%), dose indicated (41.8%) and frequency of administration (41.3%) were the next worst adherence scores. Interestingly, a mandatory directive was approved in Australia in 2013 for the adoption of a uniform approach in providing electronic patient information to a patient's national electronic health record where the patient has one (SA Health, 2013). This is still being implemented but it provides evidence of how to implement a national standard.

Also, the National Institute for Health and Care Excellence (NICE) published National Guideline 5: Medicines Optimisation in 2015. This guidance builds on the Royal Pharmaceutical Society guidance on transfer of care guidance (NICE, 2015b). The guidance is a comprehensive resource and covers safe and effective use of medicines in health and social care. It aims to ensure that medicines provide the greatest possible benefit to people by encouraging medicines reconciliation, medication review and the use

of patient decision aids. One section of the guideline is devoted to medicine-related communication systems when patients move from one care setting to another. This guidance replaced the recommendation in NICE Clinical Guideline 76: - Medicines Adherence (NICE, 2009). NICE Clinical Guideline 5 is an important resource and states some principles for best practice as indicated below:

- Complete and accurate information about the person's medication is shared.
- The new care provider receives the information and documents the information and acts on it.
- The complete and accurate information should be proactively shared ideally within 24 hours of the person being transferred and in the most effective and secure way.

In addition, the guideline specifies a minimum dataset about the patient and their medicines when there is a transfer from one care setting to another.

There are therefore several sources of officially endorsed standards for the content of a discharge summary. A comparison of the recommended information is illustrated in Table 3. This indicates the recommendations for standards from the Royal Pharmaceutical Society (RPS, 2012), the Professional Standards Record Board and Academy of Medical Royal Colleges (PRSB, 2017), SIGN, 2012; HIQA, 2013, NICE, 2015b and the electronic prescribing and medicines administration functional specification for NHS Trusts 2007 (e-prescribing toolkit, 2007). It can be observed that there is some degree of consistency in the standards for content of a discharge summary in relation to medication-related issues. However, none of the practice guidance has mandatory status or provide an evidence-base for their validity to clinical practice. It is therefore up to the local health services to define, design and implement a discharge record which then leads to lack of consistency across healthcare providers. Increasingly, this process also involves the implementation of electronic discharge summaries rather than paper-based communications.

Table 3: Recommendations for the core content of records for medicines when patients transfer between care providers

Core Content	Royal Pharmaceutical Society (2012)	SIGN (2012)	PRSB (2017)	HIQA (2013)	NICE (2015b)	e-prescribing toolkit (2007)
Patient details	✓	✓	✓	✓	✓	✓
GP details	✓	✓	✓	✓	✓	✓
Other relevant contacts eg community pharmacist, nurse	✓	✓	✓		✓	
Current Medicine (generic name)	✓	✓	✓	✓	✓	✓
Reason for medicine (indication)	✓	✓	✓	✓	✓	
Dose	✓	✓	✓	✓	✓	✓
Formulation	✓	✓	✓		✓	✓
Dose strength	✓	✓	✓		✓	✓
Dose frequency/time	✓	✓	✓	✓	✓	✓
Route	✓	✓	✓		✓	
Duration of treatment (stop date or review)		✓	✓	✓	✓	✓
Number of days of supply		✓	✓			✓
Medicine changes and reasons	✓	✓	✓	✓	✓	✓
Aids to compliance		✓	✓	✓		✓
Allergies and conditions	✓	✓	✓	✓	✓	✓

Additionally, there have also been other international guidelines that have been advocated to improve the transfer of medication-related information. In Holland the healthcare inspectorate published a policy document that included six key criteria including actual medication and reasons for changes in the medication (Uitvlugt et al, 2017). In Australia the Australian Pharmaceutical Advisory Council (APAC) published some recommendations for the content of a discharge summary in relation to medication (APAC, 2005).

1.9 The process of medication supply at discharge

When a patient is discharged from hospital there is an expectation that a discharge summary is produced for the patient, the GP and a record for the hospital.

In 2003 the Department of Health published best practice guidance on discharge from hospital considering the pathway, process and practice in the form of a workbook. This guidance was based upon the Hospital Discharge workbook first published in 1994 (Department of Health, 2003).

It recognises that often a patient's familiar medication pattern will be changed in hospital and it is important that the patient and/or their carer understand the rationale for the medication regimen. In addition, the patient's GP needs to have up-to-date information, so they can continue the medication plan when the patient is home. Elderly people often have more complex requirements at the point of transfer of care and as part of communication and information-sharing a designated person should be in place to provide details of who to contact about medication problems that occur in the first 24 hours after discharge (NICE, 2015a).

A recommendation has been made for hospital pharmacists to write discharge letters on medicines giving full medication profiles and details of changes during the patient's hospital stay (Department of Health, 2003).

1.9.1 Description of current discharge processes for medication

As previously described the type of discharge can be simple or complex. In some cases, the patient discharge will be relatively straightforward. This is often the case for patients who have an elective admission with a short length of stay and minimal medication changes. However, for more complex discharges the process can be difficult and the full process is outside the scope of this thesis. However, in relation to medication the process involves a combination of the generation of an accurate and timely discharge summary and the need to ensure the patient has sufficient supply of medication in an appropriate format either with them or at the next place of care that has been verified for accuracy.

The discharge summary will have a section that includes directions for medication at discharge commonly referred to as 'To Take Out' (TTO) or 'To Take Away' (TTA) to be

completed. If the patient has been in hospital, usually for greater than 48 hours, there is usually a requirement to provide a complete and accurate list of all medication the patient should take from hospital as well as details of medication that has been stopped on admission. The process of generating a TTA is usually the responsibility of a junior doctor either by hand or preferably using an electronic system. This TTA may well then be checked for accuracy or verified by a pharmacist. It is recognised that there will be occasions when this verification by a pharmacist does not occur as pharmacy departments do not routinely provide a 24-hour service, seven days a week. Part of the verification process will be to confirm if the patient has their own medication either in hospital with them or at home. These are often referred to as 'Patients Own Drugs' or PODs. The checking of supply means that there is avoidance of duplication of medication and reduce potential for confusion and medication error. Also, there will be financial benefits of not oversupplying medication. The pharmacist or ward-based pharmacy technician will also ensure that the patient is discharged on the optimal system for medicines adherence eg multi-compartment device. If medication is required, then this will be dispensed by pharmacy staff either remotely on the ward or in the dispensary. When the TTA is complete the discharging nurse will check the medication supplied against the final version of the electronic discharge summary. This provides an opportunity to inform the patient (and carer) of any details in relation to medication prior to discharge. The patient will be given a hard copy of the discharge summary.

Transition of care to the community requires information being sent to the GP within 24 hours of discharge. This information includes details on the TTA of medication which is part of the discharge summary and allow the patient's GP to be aware of the on-going care requirements (BMA, 2014). This discharge process is often fraught with problems. It can be time consuming, especially if it is a complex discharge involving many medicines with complex regimens often dispensed in a multi-compartment device. This can, in some cases, delay discharge due to poor discharge planning being carried out in advance of the actual discharge (Gross, 2001), and adversely affect the patient experience of discharge (Wright, 2017).

Bullock et al*,* (2017) have evaluated the hospital discharge process from the perspective of medication-related issues. The evaluation consisted of carrying out a semi-structured interview with 13 Senior Pharmacists in England. This qualitative study identified that all the hospitals used electronic discharge summaries. An electronic discharge summary

process allows hospitals to send information to the GP within the target of 24 hours. Several common themes were identified in the discharge process related to medication such as a lack of staff training on patient discharge and poor communication between hospital and community pharmacists. This will be explored more, later in the discussion.

1.9.2 Current discharge policies and processes at the study site

The Ipswich Hospital NHS Trust (IHT) is a 550-bed acute hospital with integrated community units. These community units provide intermediate and rehabilitation services located in Ipswich and East Suffolk in England.

The acute hospital serves a local population of approximately 380,000 people for Ipswich and East Suffolk and provides a full range of services for both medical and surgical specialities, emergency department, critical care, paediatrics, care of the elderly, oncology and maternity services.

1.9.3 The local standard contract for discharge

The commissioning of services between IHT and Ipswich and East Suffolk Clinical Commissioning Group (CCG) includes a requirement to provide a high level of quality of discharge summaries (Anon, 2016).

At IHT most of the discharge summaries are generated electronically using the Evolve® system, a commercially available medical document management system. The electronic discharge summaries generated are then transmitted by email to the patient's GP within 24 hours of discharge.

The Evolve® electronic discharge summary is composed of a clinical narrative detailing the patient's inpatient stay with relevant clinical information such as:

1. details of any operations and diagnostic procedures performed and their outcomes, and
2. a summary of the key, confirmed, and tentative diagnosis made during the patient's admission and International Classification of Diseases (ICD)-10 code.

In addition, there are some details regarding the patient's medication that are part of the patient's electronic discharge summary namely (NHS Digital, 2016):

(a) details of any medication prescribed at the patient's discharge to include the number of days given, type and dosage.
(b) details of medications stopped, changed, started with the reasons for change.
(c) any details of adverse reactions or allergies to prescribed medicines that were observed during admission.

These statements effectively define the local standard from a contractual point of view of what an ideal discharge summary should contain when sent to the patient's GP on discharge as required by the CCG.

1.9.4 The generation of the Evolve electronic discharge summary

Generation of an electronic discharge summary is usually undertaken by junior medical staff under the supervision of a more senior member of the medical team. At the study hospital it is known that the discharge summary is usually generated on the day of discharge in up to 95% of cases so there is often a need to complete the discharge summary quickly.

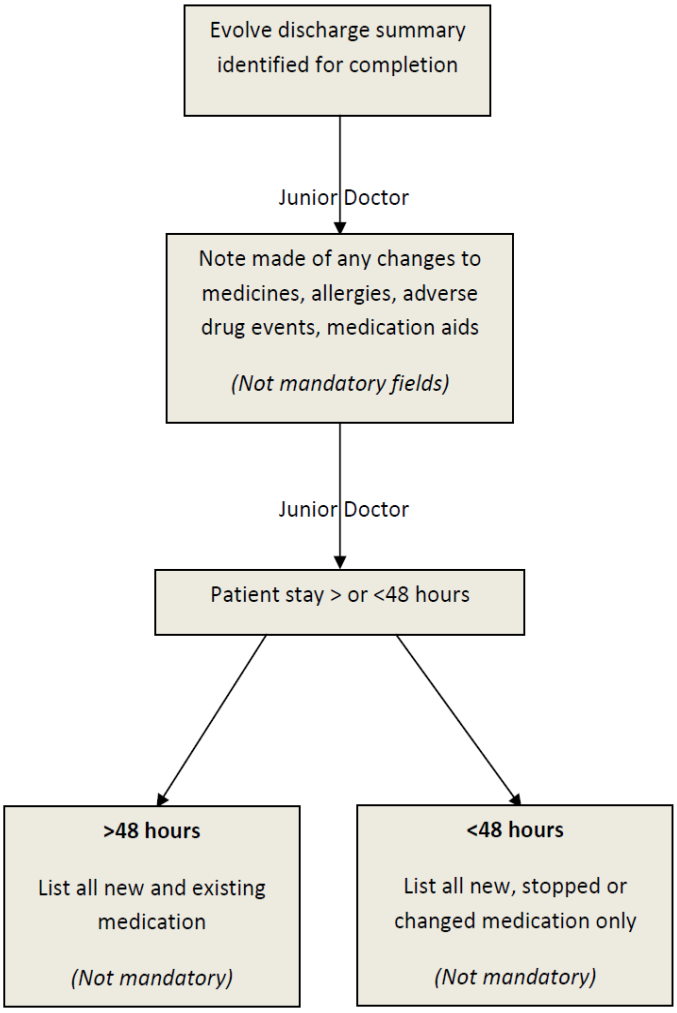

Figure 3: The process for generating an Evolve® electronic discharge summary.

Figure 3 illustrates the process for a junior doctor to produce a discharge summary indicating the different requirements for medicines depending if the admission is > or<48 hours duration. This requirement is specified within the NHS standard contract between the hospital and local CCG (Anon, 2016).

In relation to medication there are free text boxes on Evolve® for doctors (or pharmacists) to note any changes to regular medication, any allergies or adverse drug effects or medication aids for discharge. These are not mandatory fields. The next step is to acknowledge if the patient's stay is greater than or less than 48 hours. If the stay is greater than 48 hours, then it is a requirement to list all the medication whether it is new or existing.

If the length of stay is less than 48 hours then the requirement is to list all new, stopped or changed medication only or indicate there is no change in medication. Also, if the patient does not take any medication at all then this should be indicated on the discharge summary. The next step of the Evolve® electronic summary production involves a drop-down menu or fields for the doctor to type in or choose several different components. The first field requires the doctor to choose the medication. A drop-down choice of pre-defined medicines will appear to decide which preparation to select after typing in the first three letters of the medicine eg typing asp… will allow aspirin to be chosen. There is then a choice for the prescriber to indicate whether the medication is unchanged, changed, stopped or new. If the new statement is chosen, the prescriber is required to specify the indication of the new medicine. The next field to complete in order are to specify the dose, route (a drop-down choice of options appear), frequency (a drop-down choice of options appear). The prescriber is then required to specify whether the medication is required long term, as required or for a specific course. If the medication is for a specific course, then the prescriber will need to specify the details of the course. This is then repeated for all the medications required upon discharge. Finally, the prescriber is asked to specify if the patient has been informed of any side-effects of new medicines. Once the doctor has completed the electronic discharge prescription it is the responsibility of a pharmacist to clinically screen and verify the prescription prior to discharge. The pharmacist will check the patient's inpatient medication chart and cross-reference this to the electronic discharge summary. The pharmacist will also undertake a clinical screen of the discharge summary checking aspects such as: appropriate doses, routes, frequency and drug interactions, dosing in renal failure, formulations required and so on. A key component of this clinical screen is to identify any unintentional discrepancies to ensure there is accurate reconciliation on discharge between the inpatient medication chart and the final discharge summary that is clinically appropriate. The pharmacist will also indicate whether a supply of medication is required or not. The patient may need a new supply of medication or the PODs can be re-issued on discharge or the patient has sufficient supplies at home. Additionally, the format of the supply may need to be established such as whether a multi-compartment device is required for discharge. The pharmacist can make additional annotations which can be chosen to appear on the final discharge summary or not.

These annotations can be used to provide advice to the dispenser to know how to supply the medication or provide additional information to the patient's GP about the discharge

medication eg details of a reducing regimen. Once the pharmacist has completed the clinical verification for each medication this is acknowledged on the electronic discharge summary by a green tick and final authorisation or verification at the end of the process. Once this step has occurred the patient may then be discharged on the Evolve® system and physically discharged from the hospital once the discharge prescription has been prepared. When the patient's discharge summary has been authorised, a copy is given to the patient by hand and an electronic copy is sent automatically via email to the patient's GP within 24 hours of discharge. This is a crucial step in the transition of information from the hospital to the GP as it ensures the GP gets the correct information about the patient's medication on discharge in a timely manner.

However, it has been identified by local GPs using the study hospital that the process of ensuring there is an accurate and reliable source of information related to medication does not always occur. GPs have made a few complaints related to details of medication being omitted or incorrect. The hospital pharmacy service is from 8.30am to 7pm Monday to Friday and 9am to 5pm at weekends and bank holidays. This means that any discharges that occur outside of these times will not be verified by a pharmacist.

1.10 Thesis overview

1.10.1 The clinical relevance of this study and the research question

Despite national standards regarding best practice to produce a high-quality discharge summary in relation to medication, significant medication discrepancies, ADEs and readmissions persist. There is therefore a clear need to improve the quality of information at the point of transition of care especially for elderly patients with increased co-morbidities and polypharmacy (Knight et al, 2013).

The national best practice standards have lacked mandatory implementation and evidence for clinical application. Generally, the discharge summary that is used is based on local development, iteration and policy rather than the adoption of national and clear evidence-based recommendations. Increasingly it is recognised that elderly patients are particularly vulnerable to the consequences of poor quality discharge and the quality of the discharge summary in relation to medication may be an influence on this. Research to provide evidence into the processes and quality of medication-related information on discharge is scant with few published studies being carried out in the UK particularly in

elderly patients. In addition, there is a need to adopt a whole system approach to the discharge process and this includes the views and priorities of both hospital and primary care healthcare professionals on the standards of what constitutes a high-quality or 'gold standard' discharge summary.

With these issues in mind it is increasingly important to establish a 'gold standard' for a high-quality discharge summary for elderly patients based on published evidence and expert opinion using a consensus method. Furthermore, to measure adherence to this gold standard and obtain evidence of medicines reconciliation in the GP records.

There are many factors that may influence the quality of medicines-related information in the discharge summary. These factors can be split into three main groups namely: patient, medication, and system factors. For example, patient factors include patients with a prolonged length of stay, age over 85 years old, having a Charlson Co-morbidity Index (CCI) measure of four or more. Medication factors include number of medicines being taken greater than eight, classes of medicines. Whilst system factors may include level of experience of the person producing the discharge summary, how the discharge summary is generated and design of the discharge summary template. Some of these factors will be explored to establish if there is any correlation with the quality of medication-related discharge information.

To establish the applicability and usefulness of the evaluation of the quality of a discharge summary to clinical practice a further aspect of the research question is to explore whether any patient's readmission to hospital is caused wholly or partly by the level of the quality of medicine related information indicated on the original discharge summary.

1.10.2 Research aims and objectives

Research aim: To establish a locally agreed standard for the quality of medication-related information on discharge from hospital of elderly patients from an acute hospital and the subsequent medicines reconciliation in primary care.

Hypothesis: The poor quality of medication-related information on discharge and subsequent medicines reconciliation in primary care of elderly patients is likely to lead to patient readmission within 30 days of discharge.

Primary objectives

1. To produce both 'gold standards' (essential standards) and desirable standards of a discharge summary for medicines-related information in elderly patients from an acute hospital.
2. To determine the level of adherence to the 'gold standards' for medicines-related information on the discharge summary from the acute hospital.
3. To determine the extent to which the GP has acted upon the information in the discharge summary in the patient's primary care records.
4. To determine the extent to which the quality of the medicines-related information on the discharge summary led to hospital readmission using an expert panel method.

Secondary objectives

1. To determine the extent of pharmacy-led medicine reconciliation and verification of the discharge summary.
2. To determine the demographic, medication and service characteristics of the discharge summaries reviewed.
3. To determine if any patient, medication or service variables influence the level of adherence to the gold standards.
4. To recommend how the quality of medication-related information on discharge could be improved.

1.10.3 Study design

The study design was composed of three distinct phases to meet the purpose of the aims and objectives of the study.

Phase I: To establish the essential and desirable local standards for the quality of medicines-related information in discharge summaries in elderly patients from an acute hospital using a consensus-based modified e-Delphi technique. This provided a 'gold standard' for Phase II of the study.

Phase II: To measure and evaluate the type and extent of medication-related information on the discharge summary to meet the primary objectives. Also, to determine the level of adherence to the 'gold standards' obtained from the Delphi study for medication-related information in the discharge summary and determine the extent to which the GP has acted upon the information in the discharge summary in the patient's primary care records.

A non-experimental design was chosen as the principal investigator was measuring the medicines-related information on discharge retrospectively and did not require any manipulation of the contents of the discharge summary. Several variables were measured and analysed to assess any relationship between the variables and level of adherence to the 'gold standards'.

Phase III: To determine the extent to which the quality of the medication-related information in the discharge summary led to hospital readmission within 30 days of discharge. The study design employed a consensus method using an expert panel to determine severity and causality of readmission. See Figure 4 for a flow diagram of the study design.

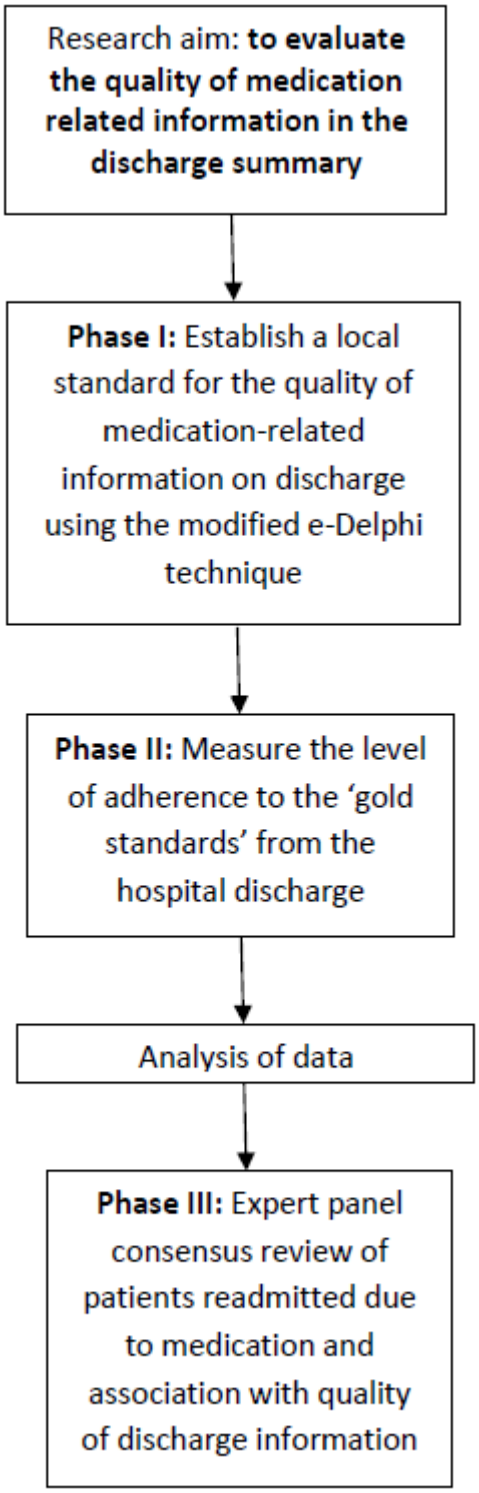

Figure 4: The three phases of research to evaluate the quality of medication-related information in the discharge summary

1.10.4 Description of thesis chapters

Chapter 1 of the thesis considers the transitions of care at discharge and implications for medication discrepancies. The issues regarding medicines optimisation for elderly patients is considered. A literature review is undertaken to consider the consequences of poor discharge in relation to ADEs, medication discrepancies and readmission to hospital due to medication-related issues. The current format and content of a discharge summary is considered based on national guidance.

Chapter 2 describes the development of standard setting in the literature and the design and application of a modified electronic Delphi study to develop 'gold standards' and desirable standards for a discharge summary in relation to medication. The method and results of Phase I of the study are considered with a discussion of the results application to Phase II.

Chapter 3 is the main part of the pilot study and is a retrospective analysis and evaluation of the demographic and medication characteristics of the discharge summaries from the study population. A level of adherence with the 'gold standards' is considered for several variables that may influence the quality of the discharge summary. Also, the extent of discharge medicines reconciliation undertaken in primary care is investigated.

Chapter 4 is an evaluation of whether any patients who were readmitted to hospital within 30 days of discharge from Phase II of the study were due to the quality of medication-related information on the original discharge summary. The narrative includes discussion on the use of a consensus method of an expert panel to assess the severity and causality of the readmission.

Chapter 5 provides an overview of the themes found to influence the quality of a discharge summary in relation to medication and measures that could be considered to mitigate medication discrepancies for elderly patient's post-discharge. Clinical implications for practice, policy and recommendations for future research are considered.

Chapter 2: To determine a 'gold standard' discharge summary related to medication-information (Phase I)

2.1 Introduction

Chapter one provided an overview of the processes involved in the transition of care at discharge, the type and consequence of medication errors at discharge and described the current practice at the study hospital.

This chapter describes the development of standard setting in medical practice and the design and application of a modified electronic Delphi study to develop a 'gold standard' for a discharge summary in relation to medication. The method and results of Phase I of the study are considered with a discussion of the results application to Phase II and implications for practice, policy and future research.

In healthcare it is important to provide good or quality care that is safe and effective and has led to the use of the principles of quality assurance to healthcare. Quality assurance is based upon some fundamental principles, of which one is the principle of adopting a standard or standards that should be established and met for a given service or product.

Once a standard has been set for a service or product it is important to ensure that this standard is then met to ensure a given level of quality. Since the 1980s with the concept of evidence-based practice, there has been considerable debate about what 'good' quality healthcare means. Sackett et al, (1996) described evidence-based medicine as the integration of clinical expertise and best external medicine. In practice, this involves considering in a constructive and systematic manner what current published evidence presents and combining this with making a considered decision about the care of an individual patient. There is, therefore, a reliance on the judicious use of well conducted clinical research to inform 'good' healthcare.

In the NHS this led to the routine adoption of medical audit to support the provision of quality clinical care (Shaw and Costain, 1989). The development of medical and subsequently clinical audit has led to a requirement for a definition of what either clinical or organisational quality healthcare means. These definitions or expressions of quality

include standards (or agreed levels of service), guidelines (recommendations to guide decision making) or mandatory guidance where health services must comply (Shaw, 2015).

Healthcare is often complex and there is often a lack of agreement of standards. The development of the enhanced status of quality standard setting in healthcare based on robust clinical research has caused some debate about what a quality standard means. Grimshaw and Russell, (1993) proposed that standards of quality define a minimum level of acceptable performance or results. It is important to be clear to define what the terms in standard-setting mean so there is clarity of interpretation when the standards are reviewed (Donabedian, 1981). Also, there needs to be recognition that it is not always possible to use evidence from quantitative research methods. In some research areas there is either inconclusive evidence or an absence of evidence, for example, in the development of consensus guidelines or standards so there is a need to adopt a technique to allow for the generation of consensus standards (Wiles et al*,* 2017).

2.1.1 Types of standard setting

It is therefore desirable when standard setting to consider the components that are required to achieve this. One of the components is that of defining an aspect that requires assessment - the criterion, and, the level or target *o*f achievement of that criterion (Crombie et al*,* 1993). Essentially, criteria assess the quality of care that has been received. The criteria should be relevant to the subject area of consideration, clearly defined and easily measurable and can be either objective or subjective. For example, an objective criterion includes taking a physical measurement or a defined observation such as a blood pressure recording. Conversely, a subjective criterion uses a clinical judgement to assess the quality of care. Subjective criteria that use clinical judgement allow some degree of flexibility as patients with different types of problems can be assessed. However, there is also a disadvantage that different observers may come to a different conclusion. A further component of standard setting is that of target setting. The target can be considered as the proportion or level of patients who should meet the criterion chosen. The level of the target should take into consideration factors such as clinical importance, practicability and acceptability (Crombie et al*,* 1993). In practice the level at which the target is set will depend upon a balance between how important the standard is and how practical it is to measure it.

Standard setting is based upon two different types that is; external and internal standards. An external standard is often set by official organisations such as Royal Colleges or other national organisations. Examples of national organisations to define quality include the Scottish Intercollegiate Guidelines Network (SIGN) (Petrie et al, 1995). Also, in England the National Institute for Health and Care Excellence (NICE) was established (Rawlins, 1999). Both organisations developed systems or processes to review evidence and develop authoritative guidelines for clinicians.

Conversely an internal standard is agreed within an audit group. The criterion, target (and exceptions) will therefore be agreed by the group. In this case the standards will have local ownership rather than being imposed. However, there may be a lack of rigour with an internal standard due to a lack of adequate information. A compromise may be to use an external standard, if it is available, and then modify it to consider local circumstances.

The process of standard setting, whether internal or external, relies upon the use of accurate information to inform the outcome. The evidence base for standard setting is therefore based on a composite of published literature, evidence from other centres, clinical judgement and assessment of current practice (Crombie et al, 1993). It should be noted that in using different centres as a source of evidence or standard setting that there are differences in the types of patients and criteria used so the interpretation of findings maybe inconclusive.

2.1.2 Consensus standard setting

In terms of clinical judgement in some cases there will be no information on which to base a target. This often leads to the need to develop a consensus. Consensus development should not be confused with consensus identification. Consensus identification often involves a group of peers who agree on a group of standards without any consideration of how they achieved the target. In contrast, consensus development involves an interaction between groups of people. In undertaking this, consideration needs to be given to how established the group is. For example, care needs to be taken when there are group members who are disruptive, dominant or particularly skilled in leadership as they may introduce bias into the process (Ellis and Whittington, 1993). There are a few advantages of using a group to develop consensus in standard setting. These include the ability to have a wide body of opinion and individual group members are more likely to

understand the implications and support its implementation. Disadvantages of using a group include participants being easily persuaded and failing to consider all the relevant information.

Consensus techniques are often used when there is a conflict in evidence. It allows a quantitative estimate through a qualitative approach. Consensus techniques are used to allow group facilitation to determine a level of consensus among a group of experts by 'aggregation of opinions into refined agreed opinion' (Campbell and Cantrill, 2001). These consensus techniques include methods such as brainstorming, nominal group technique, surveys and Delphi methods. The nominal group technique is a structured technique which involves face-to-face group meetings. The method of the nominal group technique is that members are introduced to the problem or task. After a period of silence, the group leader asks all members to contribute an idea. Each idea is recorded until all the ideas have been exhausted. Following this there is a process to vote to rank or rate independently and anonymously the ideas by each group member and the consensus of the group is then the assimilated outcome of the votes (Jones and Hunter, 1995).

2.1.3 The Delphi technique of standard setting

The Delphi technique is often employed when there is no other method that can be used where the problem that needs to be solved is not amenable to standard approaches (Ellis and Whittington, 1993). The Delphi technique originated in the United States of America (USA) by the Rand Corporation to develop the defence strategy (Dalkey and Helmer, 1963). Its application has subsequently expanded since then into other disciplines such as science, education, health, social science and quality assurance. The Delphi technique avoids using face-to-face groups by keeping group members separate from each other. It aims to collect, assimilate and refine views made by a notional group of 'experts' on a specific issue (Ellis and Whittington, 1993). The Delphi technique has also been widely used in medication-related research such as: to define medication wastage (West et al, 2015), define performance indicators for medicines reconciliation on admission (Aljamal et al, 2016) and post-discharge medicines use reviews for elderly patients (Ramsbottom et al, 2018).

2.1.4 Definition of the Delphi technique

The Delphi technique is defined as a structured, isolated, indirect, multi-stage interaction method to determine consensus using repetitive administration of anonymous questionnaires, usually across two or three rounds. There are four features which identify the Delphi technique and these are: anonymity, iteration with controlled feedback, statistical group response, and expert input (Goodman, 1987 and Cantrill et al, 1996).

The process of the classic Delphi technique has been described as involving several steps namely: identifying the research problem, reviewing the literature, choosing a methodology, developing criteria, identifying a panel and number of experts, undertaking several rounds, deciding the mode of iteration and then data analysis and presentation (Wilkes, 2015).

2.1.5 Characteristics of a Delphi technique study

If the Delphi technique is utilised as the research method to gain a consensus for a given problem then it is important to consider the factors that may influence the outcome of the study.

The composition and size of the expert panel to undertake the Delphi technique is an important consideration. The panel is usually composed of experts who have knowledge and experience of the research problem. They also have capacity and willingness to participate, have time to participate and possess effective communication skills (Wilkes, 2015). The researcher must therefore consider what constitutes an expert for their area of study before it commences. Criteria which need to be considered to have an expert panel participant include gender, professional experience, education, employment or designation (Keeney et al, 2006).

There are no defined acceptable numbers of participants for a panel to carry out a Delphi study and varies upon the extent of the issues and resources available (Wilkes, 2015 and Powell, 2003).

However, in deciding upon the size and composition of the panel there needs to be a balance between having a large size but being difficult to manage with higher drop-out

rates versus having a small panel which may introduce bias and not be generalisable (Gill et, 2013).

If the panel is comprised of homogenous members ie same professional group then the sample may be smaller (10 to 15 people) (Wilkes, 2015). In clinical studies this provides more benefit as panel members are specialist in the area (Jones and Hunter, 1995). A heterogenous group ie panel members with varying perspectives and personalities may facilitate a high-quality solution compared to a homogenous group (Powell, 2003). A larger panel will provide more convincing verification whilst a smaller size may require a follow-up study to ensure verification (Skulmoski et al, 2007).

The expert panel are often purposively selected to ensure that the participants have an awareness and knowledge of the subject matter and may be more motivated to respond to the questionnaire. However, this in itself may also introduce bias, as, only interested members may respond to the study (Keeney et al, 2006).

Another consideration when carrying out the Delphi technique is the number of rounds or iterations undertaken. There is no defined number of rounds that should be undertaken in a study. It is often variable and depends upon the reason for the research. Most Delphi studies involve two or three rounds (Powell, 2003; Keeney et al, 2006). In deciding the number of rounds to undertake, a pragmatic approach is often taken considering factors such as the amount of time available or geography/location of the expert panel participants. This needs to be taken into consideration alongside the balance of keeping the number of rounds to a minimum to prevent a reduction in response rates (Starkweather et al, 1975).

Before the first questionnaire or round is undertaken there is some value in undertaking a pilot questionnaire. This will support the identification of any ambiguities and ease the administration of the study being undertaken (Powell, 2003). However, there is no absolute requirement to undertake a pilot questionnaire when undertaking a Delphi study. In addition, there is also the option to pre-test each subsequent questionnaire (Skulmoski et al, 2007).

The first-round questionnaire can be designed to give an initial open response. A qualitative analysis is then undertaken to allow further questionnaires to be developed.

Alternatively, more semi-structured or structured questionnaires can be used (Powell, 2003). In trying to establish consensus in a clinical setting it may be desirable to construct the initial questionnaire based on published literature if this is available. This is often where there is a potential consensus emerging or an idea of the criteria that may need to be considered (Duffield, 1993). Any second or subsequent rounds will then be more specific based upon the analysis of the results from the initial round. The method of analysis will often be undertaken by ranking or rating the results to establish a consensus opinion (Powell, 2003).

The method or interaction in undertaking a Delphi study can vary. Clearly the use of pen and paper is still a method that is available to a researcher. However, electronic (e) methods are now available that provide many advantages to both the researcher and participant. This is often referred to as an e-Delphi technique. This provides the ability to have a quicker turnaround, easier contact with participants and easier analysis of data as distinct advantages (Skulmoski et al*,* 2007). The e-Delphi technique can be undertaken by email or completion of an online form (Worth et al*,* 2010; Gill et al*,* 2013). A web-based e-Delphi technique is a cost effective and simple method for all participants to respond from diverse locations. It also allows direct importation of data for analysis. There are several commercially available web-based survey systems that are easy to set-up with low cost. One of these is SurveyMonkey® and allows the use of predetermined questions to be emailed to the panel. This is a so called 'reactive Delphi' technique as it does not utilise open statements (McKenna, 1994).

The next consideration in the Delphi technique is data analysis and results reporting. This will depend upon the type of questions used. So, for example if lists are requested from the participants, a qualitative content analysis may be carried out. A content analysis technique can be used to identify themes that have emerged from the initial unstructured questionnaire. A structured questionnaire can then be formulated for the following rounds (Powell, 2003; Wilkes, 2015). Alternatively, a scoring scale such as a Likert scale can be used. This will then allow a measure of the consensus which can be calculated as a percentage of responses to present the results found (Wilkes, 2015).

There is a lack of agreement to define when consensus is reached using the Delphi technique (Powell, 2003). The most common definition uses a percent agreement (Diamond et al, 2014) with the threshold varying from 55% to 100% (Powell, 2003). This

threshold may be based upon the importance of the research subject (Keeney et al, 2000). McIlrath et al, 2010 and McKenna et al, 2002 used a 70% agreement. Keeney et al, 2006 used 75%.

In this current study a threshold of consensus was set at ≥80%. This was based on the study by Green et al, 1999. This study determined the views of GPs information requirements which has some similar characteristics to this study in determining GPs views (amongst others) of the information requirements of a discharge summary. A level of at least 80% was agreed, based on statistical advice, for consensus. This consensus, however, does not imply that the correct answer has been established but that the panel have agreed on a set of questions posed (Keeney et al, 2001).

A further component of any research carried out including the Delphi technique is the establishment of the rigour of method. That is, to ensure that procedures have been followed and confounding factors have been minimised. For quantitative research this process of rigour is based on the assessment of reliability and validity. Reliability being the ability to achieve similar results under constant conditions during a study whilst validity measures both the generalisability of the results and the confidence placed in cause and effect (Hasson and Keeney, 2011). One of the challenges of the Delphi technique (in whatever form) is that there is an absence of precise definitions of the methods and this means there is a difficulty to establish what reliability and validity mean (Hasson et al, 2000). Content validity is usually achieved when 70% of respondents agreed to inclusion of items (Wilkes, 2015). Furthermore, there is some issue as to whether the Delphi technique is a qualitative or quantitative design. This has led to the suggestion that a measure of rigour for both qualitative and quantitative research be applied to a Delphi study (Hasson and Keeney, 2011). It is often found with questionnaire-type research that the response rates can be variable or low. If the participants in a Delphi study have some degree of ownership of the problem then the response rate may be improved. By enhancing the response rate there will be more confidence or rigour in the outcome (Keeney et al, 2006).

In summary, the classic Delphi technique or process usually consists of a series of rounds that take place. Initially there is a first round qualitative questionnaire to identify opinions of relevant individuals. The participants are chosen based on the knowledge and experience in relation to the subject matter. The individuals usually remain anonymous

for a classic Delphi technique. The views of the participants can be assimilated under several headings and a draft circulated to participants as a questionnaire. In round two the participants identified in round one highlight their agreement with each statement on the questionnaire. The rankings obtained are then summarised and then circulated in a revised version of the questionnaire. This is therefore an iterative process and can be repeated if necessary through controlled feedback. The participants can reconsider their responses which may be different from previous rounds. It is essentially a democratic process that aims to facilitate a group opinion or judgement that can be considered representative of the participants. Finally, the rankings are then summarised and assessed for degree of consensus. This therefore constitutes the statistical group response component. The information fed back to the participants through the successive questionnaires provides a statistical summary of the group's views. This is often achieved by a ranking process.

The Delphi technique is therefore a quick and simple method to gain consensus where knowledge is incomplete. It has the advantages of avoiding face-to-face bias and to involve larger numbers of individuals than could be otherwise. Its disadvantages include the time taken for the consultation process and potential for a high attrition rate after several rounds. Also, there is a potential to select unsuitable 'experts' and provide biased or confusing comments.

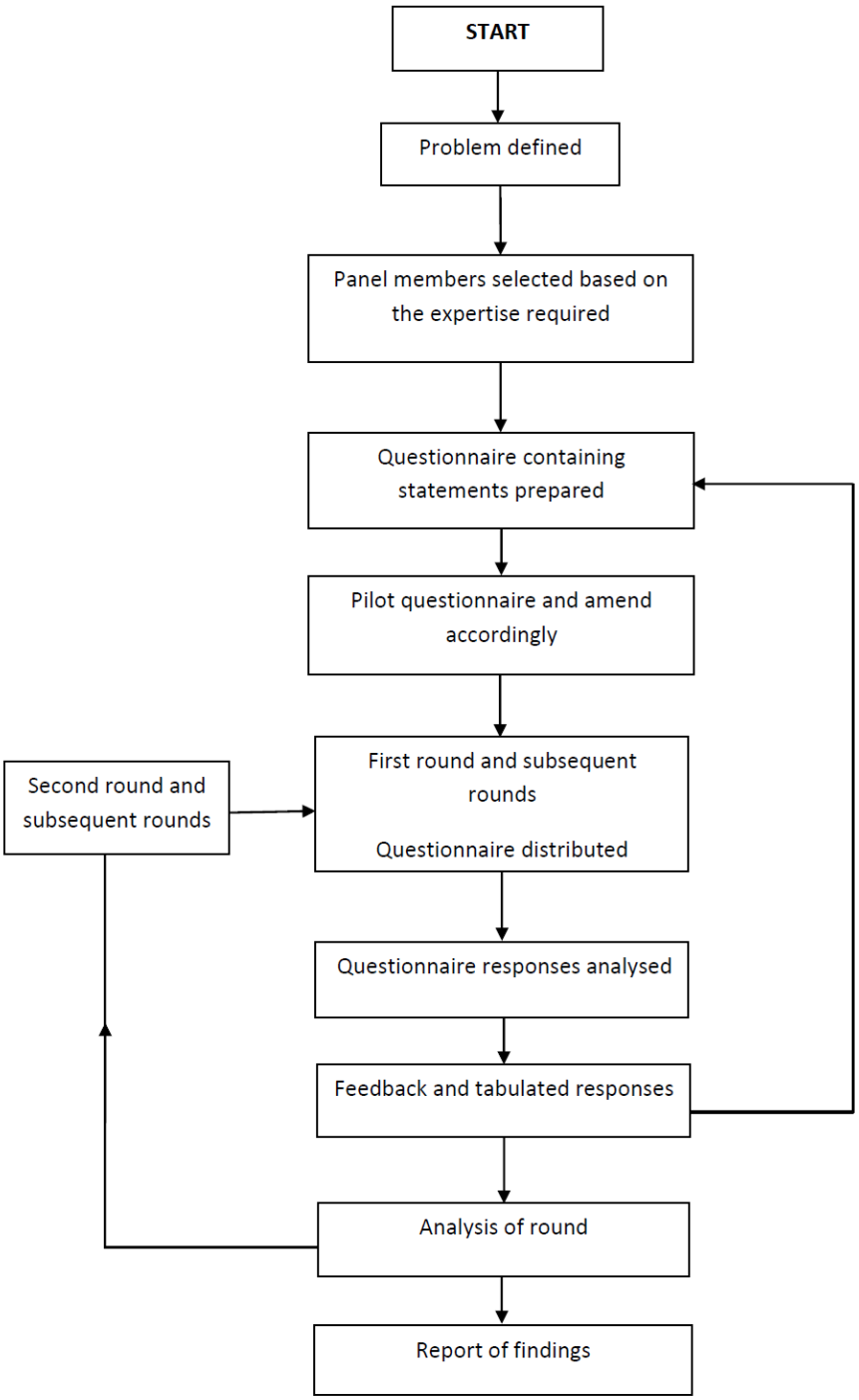

Figure 5: The process for a Delphi study

Figure 5 shows the steps involved in a two or more round Delphi study adapted from Avery et al, 2005 and Worth et al, 2010.

In this study the Delphi technique was considered and used for forming a consensus. It was chosen as it enabled a wide group of experts across both primary and secondary care to be consulted across a wide geographical area which otherwise would have been

difficult to do. The expert group was multi-professional in nature but interested in the problem area. There may also have been bias by different healthcare professionals or dominant views of members if there had been a face-to-face meeting. So, the nominal group technique and brainstorming methods were disregarded.

2.2 Method

In this phase, the objective of setting a local standard for a high-quality discharge summary related to medication requirements relies upon certain criteria being met. These criteria were used to allow an expression of a quality standard (Grimshaw and Russell, 1993). The criteria that were chosen for the development of standards were based upon both published evidence or consensus and local expert opinion (Skulmoski et al, 2007). In this study, standards were obtained from authoritative organisations and publications. However, these standards did not have mandatory status in application and no targets were set. They were, therefore, guidelines with little ability to compare with other centres. In providing the quality standard the criterion used then had a level of performance or target allocated to it to determine the level of importance of the standards to determine if they were essential or desirable standards using a modified Delphi technique.

It was also important to consider local opinion of both secondary and primary care healthcare professionals because they may have different perspectives or priorities (Yemm et al, 2014).

There is currently a lack of UK national mandated information to be included on a discharge summary in relation to medicines. This is despite several authoritative bodies publishing guidance. The guidance on medicines optimisation issued by NICE builds on the previous guidance published by the Royal Pharmaceutical Society and the Academy of Medical Royal Colleges which provide a baseline to start from (NICE, 2015b; HSCIC, 2013; RPS, 2012). The core elements of a discharge summary recommended by NICE include the following:

- Patient and GP contact details;
- Details of other relevant contacts eg nominated community pharmacy;
- Known drug allergies and reactions;

- Current medicines (including non-prescribed) including name, strength, form, dose, route, timing, frequency, duration, how the medicines are taken and what they are being taken for;
- Medicine changes and reasons for them;
- Date and time of the last dose for weekly or monthly medicines;
- What information has been given to the patient or carers; and
- Other necessary information eg when to review, monitoring requirements, and support needed for adherence and for specific groups of patients, such as children.

These core elements were therefore used to inform the development of the Delphi questionnaire.

2.2.1 Modified electronic (e) Delphi technique

The e-Delphi technique that was utilised in this study was a modified version of the classical Delphi technique to develop consensus. The modifications included using an open-ended question in both rounds and using an on-line rather than paper questionnaire (McIlrath et al, 2010 and Aljamal et al, 2016). SurveyMonkey® was used as a tool to decide the essential and desirable standards. This is a free to use readily available tool which allows surveys to be conducted quickly and efficiently on- line. The tool also allows some data analysis.

The e-Delphi technique undertaken was a systematic and iterative process administering two rounds of surveys to an expert panel.

2.2.2 Setting

The e-Delphi technique carried out was conducted in East Suffolk. This is a rural county in England with a local population of approximately 380,000 people. The primary healthcare service is commissioned and monitored by the Ipswich and East Suffolk Clinical Commissioning Group (CCG). Secondary care or hospital services are mainly provided by The Ipswich Hospital NHS Trust (IHT). This is a local district general hospital with approximately 550 beds.

2.2.3 Ethical considerations

The study protocol was discussed with the hospital's information governance lead and research and development manager. Both were agreed that this study was a survey and did not require ethical review as the expert panel members were acting in a professional rather personal capacity and confidentiality was maintained throughout the study. The study was conducted in an anonymous way and the responses from the expert panel members were not identifiable.

2.2.4 Panel of experts

At the time of this study IHT and Ipswich and East Suffolk Clinical Commissioning Group (CCG) had a joint Clinical Quality Improvement Task (CQIT) group consisting of senior clinicians and commissioners of both organisations. The group had the remit to discuss quality improvement issues that affected the interface between the acute hospital as provider of services to the CCG and primary care users notably local GPs. One of the issues that had been discussed on previous occasions was the low-quality of discharge summaries that were being sent to GPs via an electronic method. Anecdotally the GPs had identified deficiencies in the information on transition of care of patients to primary care particularly regarding the medication-related information. The principal investigator is chief pharmacist at IHT and a member of CQIT, and, could brief the task group on some of the discussions regarding the quality of discharge information. Support was therefore sought following a presentation to the CQIT group for members to participate in the e-Delphi technique to establish a local standard for a quality discharge summary in relation to medication-related information. In addition, members of the local hospital Medicines Optimisation Committee were also invited to participate in the survey.

The panel of experts in this study was composed of a relatively homogenous group of healthcare-related professionals. The participants were identified as being key stakeholders in the establishment and provision of healthcare services in East Suffolk from both primary and secondary care. The term 'expert' used in the context of a Delphi study has been described as "clinicians practicing in the field under consideration" (Jones and Hunter, 1995). Therefore, the participants selected in this study were either potential users of the service or were involved with the overall management of generation or receipt of discharge summaries as part of their daily activities or were regularly involved in the review of the quality of discharge summaries. Therefore, the invited experts

consisted of practising GPs and hospital consultants, senior practising pharmacists from both the hospital and CCG, senior nurses involved with clinical quality, and executive directors with a portfolio for clinical quality. A patient representative was from the local hospital patient user group and had an interest in matters relating to prescribing and medicines.

2.2.5 Questionnaire design

A review of published UK standards in relation to the content of medication-related information was undertaken. It was decided to exclude other international standards which have been published due to differences in the delivery of healthcare services in other countries outside the UK.

The standards used were those published by the RPS (Picton and Wright, 2012 and RPS, 2012), Scottish Intercollegiate Guidelines Network (SIGN) (Petrie et al*,* 1995) Health and Social Care Information Centre and the Academy of Medical Royal Colleges- Standards for the clinical structure and content of patient records (HSCIC, 2013) and NICE Clinical Guideline 5 - medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes (NICE, 2015b). (At the time of the study the PRSB standards were not published but have not substantively changed anyway (PRSB, 2017)).

An initial questionnaire was designed using the common themes identified in the four published standards. Seven groups of criteria were established with each group having a statement that related to a quality element. There was also a section at the end for the expert panel members to make any other relevant comments on the study. An initial pilot study was carried out with four participants who were a local GP and chairman of the local Clinical Prioritisation Group for the Ipswich and East Suffolk CCG, a hospital consultant and two senior hospital pharmacists. The pilot established the content and face-validity of the questionnaire and the questions could be answered without further clarification. A minimum threshold of consensus at each round was set at ≥ 80% for the criteria (Green et al, 1999).

To gain consensus a two-round e-Delphi technique was employed. The commercial web-based system, SurveyMonkey®, was used.

2.2.6 e-Delphi round 1

The questionnaire was circulated to the participants using an email direct to the panel members with a request to complete the questionnaire using a SurveyMonkey® link. The questionnaire consisted of seven sections with a final question requesting open comments on any additional issues that the participant felt should be considered regarding a quality discharge summary related to medicines. The expert panel participants were asked to rank their level of agreement with the statements indicating an appropriate response as either: essential, desirable or not needed. Participants were reminded after several weeks to complete the round 1 questionnaire to increase the number of responses.

2.2.7 e-Delphi round 2

The round two questionnaire was amended based on the responses from round one. Responses with a score of ≥ 80% agreement were considered as essential and less than 80% as desirable standards. The participants were then sent a further email with a request to compete a further SurveyMonkey® questionnaire. The second round consisted of four themed sections. The questions were split into two relating to essential standards, one relating to desirable standards and one again requesting for additional comments that should be considered as part of the response. The expert panel participants were asked to rank their level of agreement with the statements indicating an appropriate response as either: essential, desirable or no preference. After the initial request for a response, a reminder was sent by email to the participants to encourage more responses before final analysis was carried out. It was felt that consensus had been achieved in undertaking the two rounds and no further questionnaires were circulated.

2.2.8 Results

A total of 29 expert panel members were recruited composed of five GPs, 13 consultants, five senior pharmacists, two commissioners, three senior nurses and one representative of a patient user group. Table 4 describes the panel of experts invited to participate and where they were from.

Table 4: List of participants for the e-Delphi questionnaire

Panel of experts - designation	Recruitment source	Number of participants
GP	CQIT	5
Consultant	CQIT and Medicines Optimisation Committee	13
Pharmacist	CQIT and Medicines Optimisation Committee	5
Nurse	CQIT and Medicines Optimisation Committee	3
Lay representative	Local patient user group	1
Commissioner	CQIT	2

Seventeen (58.6%) responses from the participants were generated from round one and were analysed using the SurveyMonkey® resource. Each question was grouped according to the criteria presented of being an essential, desirable or not needed quality standard. Questions that generated a response of ≥ 80% were considered to reach a consensus as being essential and <80% as a desirable standard. Of the 17 responses, one participant chose to disregard all the responses and was excluded so 16 (55.2%) responses formed the final assessment.

2.2.8.1 Standards for a quality discharge summary - round 1

The results for round one of the e-Delphi study are shown in Table 5. The percentage reported indicates the level of consensus of the panel members with the number (n) of respondents indicated.

Table 5: Results of round 1 of the e-Delphi study

Description of standard	Essential standard (%) (n)	Desirable standard (%) (n)	Not needed (%) (n)	Total (%) (n)
Route of administration	100.00% (16)	0.00% (0)	0.00% (0)	100.00% (16)
Duration must be specified if it is a course	100.00% (16)	0.00% (0)	0.00% (0)	100.00% (16)
Generic name with the dose and frequency	93.75% (15)	6.25% (1)	0.00% (0)	100.00% (16)
Strength and form	87.50% (14)	6.25% (1)	6.25% (1)	100.00% (16)
If the treatment is long-term it should indicate this on the discharge summary	81.25% (13)	18.75% (3)	0.00% (0)	100.00% (16)
Record all medicines that were stopped during the hospital stay	81.25% (13)	18.75% (3)	0.00% (0)	100.00% (16)

Description of standard	Essential standard (%) (n)	Desirable standard (%) (n)	Not needed (%) (n)	Total (%) (n)
Indicate the monitoring or review requirements of any medication prescribed on discharge	81.25% (13)	18.75% (3)	0.00% (0)	100.00% (16)
Record any adverse reactions to medicines or their ingredients	75.00% (12)	25.00% (4)	0.00% (0)	100.00% (16)
Indicate the date and time of the last dose where relevant such as for weekly or monthly administrations	75.00% (12)	25.00% (4)	0.00% (0)	100.00% (16)
Record the allergy status on discharge of the patient	68.75% (11)	25.00% (4)	6.25% (1)	100.00% (16)
If no medicines are prescribed for the patient at the time of discharge this should be indicated on the discharge summary	68.75% (11)	31.25% (5)	0.00% (0)	100.00% (16)
Record why a medicine was stopped during the hospital stay	56.25% (9)	43.75% (7)	0.00% (0)	100.00% (16)
Provide a reason for a change to admission medication dose ie dose increase or decrease	50.00% (8)	50.00% (8)	0.00% (0)	100.00% (16)
Record any problems related to adherence of prescribed medicines*	46.67% (7)	46.67% (7)	6.66% (1)	100.00% (15)
Provide details of who to contact regarding medication queries on discharge	43.75% (7)	50.00% (8)	6.25% (1)	100.00% (16)
Indicate what advice has been given to the patient, family or carers where appropriate related to the management of care ie dose escalation of steroids	37.50% (6)	62.50% (10)	0.00% (0)	100.00% (16)
Details must be provided of what the medication is being used for ie the indication	31.25% (5)	62.50% (10)	6.25% (1)	100.00% (16)
Provide information on aids to compliance that have been provided eg monitored dose aid	31.25% (5)	56.25% (9)	12.5% (2)	100.00% (16)
Provide details of other relevant contacts where appropriate eg nominated community pharmacy	18.75% (3)	62.5% (10)	18.75% (3)	100.00% (16)
Indicate what written information has been given to the patient, family or carers where appropriate related to the management of care eg medication reminder card	12.50% (2)	87.50% (14)	0.00% (0)	100.00% (16)

*denotes one respondent did not respond to question

Three additional comments made by members of the panel are shown in box 1:

There should be a balance between details and time required to do so. Whilst in utopia ALL details are a must, a junior doctor quite frequently gets haggled by staff to do a "quick discharge" and in those circumstances, such deemed high standards cannot be met. Hence, we should have a two-tier system: 1. Essential: allergies, drug reactions, new medications and indications, stoppages and indications, duration of treatment, specific instructions etc. 2. Desirable: everything else. Hope this helps.

Often the list is incomplete with no indication whether meds have been stopped or simply omitted. Good to indicate as you often do what is new and what has been stopped.

Advice on specials such as liquid products and how/where to obtain formulations where these are not the norm, notification of an incident which has occurred and affected the patient during their hospital admission, weight and renal function as baseline information for the GP if relevant to the medication prescribed (eg enoxaparin), recent warfarin doses and INRs to assist the anticoagulant monitoring service (AMS) team in future dosing, a link to referral forms when a drug is prescribed eg anticoagulant prompts a pop up referral to AMS.

Box 1: Additional comments made by respondents in a free text section of the e-Delphi questionnaire

The results in round one with a score of ≥ 80% indicated a high level of consensus and informed round two as being an essential standard and indicated in Table 6.

Table 6: Essential standards identified from round 1 of the e-Delphi study

Question	% response for essential standard
Include the route of administration	100.00
The duration must be specified if it is a course	100.00
Include the generic name with the dose and frequency	93.75
Include the strength and form	87.50
If the treatment is long term it should be indicated on the discharge summary	81.25
Record all medicines that were stopped during the hospital stay	81.25
Indicate the monitoring or review requirements of any medication prescribed on discharge	81.25

2.2.8.2 Standards for a quality discharge summary - round 2

Following the results of round one, a further iteration of the e-Delphi technique was carried out. In the questionnaire that was distributed by email with a SurveyMonkey® link, the questions were split into essential and desirable standards. In round 2, of 29 individuals originally invited, ten (34.5 %) completed round two. All the responses were anonymous. The results are indicated in Table 7.

Table 7: Results of round 2 of the e-Delphi study

Essential standard	Agree	Disagree	No preference	Total
Include the route of administration	100.00% (10)	0.00% (0)	0.00% (0)	10
The duration must be specified if it is a course	100.00% (10)	0.00% (0)	0.00% (0)	10
Include the generic name with the dose and frequency	100.00% (10)	0.00% (0)	0.00% (0)	10
Include the strength and form	80.00% (8)	0.00% (0)	20.00% (2)	10
If the treatment is long-term it should indicate this on the discharge summary	100.00% (10)	0.00% (0)	0.00% (0)	10
Record all medicines that were stopped during the hospital stay	90.00% (9)	10.00% (1)	0.00% (0)	10
Indicate the monitoring or review requirements of any medication prescribed on discharge	90.00% (9)	10.00% (1)	0.00% (0)	10

Desirable standard	Agree	Disagree	No preference	Total
Indicate the date and time of the last dose where relevant eg weekly or monthly administration	100.00% (10)	0.00% (0)	0.00% (0)	10
Record the allergy status on the discharge of the patient	100.00% (10)	0.00% (0)	0.00% (0)	10
If no medicines are prescribed for the patient at the time of discharge, this should be indicated on the discharge summary	100.00% (10)	0.00% (0)	0.00% (0)	10
Record any adverse reactions to medicines or their ingredients	100.00% (10)	0.00% (0)	0.00% (0)	10
Record why a medicine was stopped during the hospital stay	90.00% (9)	0.00% (0)	10.00% (1)	10
Provide a reason for a change to admission medication dose ie dose increase or decrease	90.00% (9)	10.00% (1)	0.00% (0)	10

Desirable standard	Agree	Disagree	No preference	Total
Provide details of who to contact regarding medication queries on discharge	90.00% (9)	0.00% (0)	10.00% (1)	10
Record any problems related to adherence of prescribed medicines	70.00% (7)	0.00% (0)	30.00% (3)	10
Provide information on aids to compliance that have been provided eg monitored dose aid	70.00% (7)	0.00% (0)	30.00% (3)	10
Indicate what written information has been given to the patient, family or carers where appropriate related to the management of care eg medication reminder card	60.00% (6)	0.00% (0)	40.00% (4)	10
Indicate what advice has been given to the patient, family or carers where appropriate related to the management of care eg dose escalation of steroids	60.00% (6)	0.00% (0)	40.00% (4)	10
Details must be provided of what the medication is being used for ie the indication	50.00% (5)	20.00% (2)	30.00% (3)	10
Provide details of other relevant contacts where appropriate eg community pharmacy	40.00% (4)	0.00% (0)	60.00% (6)	10

Three comments from unknown participants are shown in box 2.

Please remember that if an increased amount of information is required on an e-TTA the form will take longer to fill in.

Some of the questions would depend on the drug being prescribed. eg monitoring and review, if it is standard treatment such as blood pressure tablets or statin, I would expect the recipient to have this knowledge, if shared care this would have been already been discussed. It would be where the drug and/or indication is unusual that I would expect this to be supplied. There is also a responsibility for the recipient to clarify anything they are unsure about.

If any information is handwritten it needs to be legible. Also, the name of the signature and the name of the consultant team needs to be clear, not just initials and scribbles. If a standard proforma is used, which has standard dose, say for unlicensed medication, the form should not be adapted and counter signed. (suggest as midazolam gel).

Box 2: Additional comments made by the respondents in a free text section of the e-Delphi questionnaire

The results of the second round when compared to the first round essential and desirable standards are summarised in Table 8 with codes for each standard for reference. It can be observed from the results in Table 8 that there is an increase in the percentage score from round one to round two of the e-Delphi technique for all the essential and desirable standards except for the inclusion of the strength and form score. In this case there is still a consensus level of 80%.

Table 8: Comparison of the consensus results from round 1 to round 2

Standard	Essential result: agree (%) round 1	Essential result: agree (%) round 2	Code
Include the route of administration	100	100	E1
The duration must be specified if it is a course	100	100	E2
Include the generic name with the dose and frequency	93.75	100	E3a, E3b, E3c
Include the strength and form	87.5	80	E4a, E4b
If the treatment is long-term it should indicate this on the discharge summary	81.25	100	E5
Indicate the monitoring or review requirements of any medication prescribed on discharge	81.25	90	E6
Record all medicines that were stopped during the hospital stay	81.25	90	E7a

Standard	Desirable result: agree (%) round 1	Desirable result: agree (%) round 2	Code
Record any adverse reactions to medicines or their ingredients	75	100	D1
Indicate the date and time of the last dose where relevant eg weekly or monthly administration	75	90	D2
If no medicines are prescribed for the patient at the time of discharge this should be indicated on the discharge summary	68.75	100	D3
Record the allergy status on the discharge of the patient	68.75	100	D4
Record why a medicine was stopped during the hospital stay	56.25	90	D5a
Provide a reason for a change to admission medication dose eg dose increase or decrease	50	90	D6
Record any problems related to adherence of prescribed medicines	46.67	70	D7

Standard	Desirable result: agree (%) round 1	Desirable result: agree (%) round 2	Code
Provide details of who to contact regarding medication queries on discharge	43.75	90	D8
Details must be provided of what the medication is being used for ie the indication	31.25	50	D9
Indicate what advice has been given to the patient, family or carers where appropriate related to the management of care eg escalation of steroids	37.5	60	D10
Provide information on aids to compliance that have been provided eg monitored dose aid	31.25	70	D11
Provide details of other relevant contacts where appropriate eg community pharmacy	18.75	40	D12
Indicate what information has been given to the patient, family or carers where appropriate related to the management of care eg medication reminder card	12.5	60	D13

2.3 Discussion

This is the first study that has described the use of a modified e-Delphi technique to describe a consensus gold standard of a discharge summary for medication-related information using an expert panel. Also, it is the first attempt to use the national published standard statements such as those developed by the RPS (2012), the Academy of Medical Royal Colleges (HSCIC, 2013), SIGN (2012) and NICE Clinical Guideline-Medicines Optimisation (NICE, 2015b) to produce a set of locally developed consensus standards. Based on the agreed consensus level, 20 standards were identified, seven of which were classified as essential and 13 as desirable standards. The essential standards identified therefore represent the gold standards.

In this study the classical Delphi technique was modified by including an open-ended question and using an on-line rather than a paper-based questionnaire. The use of on-line or electronic (e) method facilitated anonymity between the expert panel members which is one of the characteristics of a Delphi study (Hsu and Sandford, 2007).

Consensus was achieved if a score of ≥ 80% respondents agreed with the standard statement in the rounds of the Delphi study. It was decided to divide the standards into essential and desirable with any results ≥ 80% being an essential standard and results <80% being a desirable standard after round one. This was done in recognition that it is not always possible to ensure that all medication-related information can be included in the discharge summary. The differentiation between essential and desirable standards allowed consideration of the core information that the GP requires and allows prioritisation of medical staff time when completing a discharge summary to focus on providing the information most valuable to the GP. This approach was supported by a comment made by a panel member from one of the Delphi rounds and the e-prescribing toolkit (2007). Also, a recent study by Fitch et al, (2017) carried out in a UK hospital evaluated the quality of information of discharge summaries sent to GPs after hip fractures. The GPs reported that some information was essential whilst others that it was beneficial or desirable and supports the approach taken in this study.

All the essential standards apart from E4 (include the strength(E4a) and form(E4b)) had either an increase or no change in the level of consensus from round one to round two. This suggests that the panel experts reached agreement on what essential information is needed for a discharge summary.

The essential standards E1 (route of administration), E3a (generic name), E3b (dose) and E3c (frequency specified), E4a (strength), E4b (form) and E7a (record of medicines stopped) were all specified in the five key nationally published standards recommendations (RPS, 2012; SIGN, 2012; HSCIC, 2013, PRSB, 2017 and NICE, 2015b). The standard E2 (duration) was specified in four of the five key nationally published standards. These findings would confirm that there is agreement locally with national standards despite published national standards lacking an evidence base. Interestingly, in this study standards E5 (if the treatment is long term) and E6 (indicate monitoring or review requirements) are not listed in the national recommendations. This has a potential impact on clinical practice as this study reflects the opinions of local experts and practitioners and reflects a real-life experience. This preliminary study should therefore be carried out on a wider scale to increase the reliability and validity to increase generalisability and confidence of the results.

Essential standard, E4a (strength) and E4b (form) had a lower level of agreement in round two dropping from 87.5% to 80%. The reason for this may be due to the reduced number of respondents in round two who felt this was an essential standard, decreasing from 14 to 8, and any small difference in number of responses would have a large effect on the result.

Also, some respondents may have felt that both the strength and form are implicit from the description on the discharge summary and not an essential information requirement. For example, for most oral medicines the relationship between the dose and strength is not essential for the GP to know, as the dose may be the same as the strength or a multiple of the strength.

A consensus of ≥80% for consensus was agreed as per Green et al, (1999) so the inclusion of E4a and E4b as an essential standard was still justified. This data is also supported from some key national recommendations which includes the strength and form as part of the core content of a discharge summary (SIGN, 2012; RPS, 2012).

There were two standards that scored 75% level of agreement after round one ie D1-recording any adverse reactions to medicines or their ingredients, and, D2-indicate the date and time of the last dose where relevant eg weekly or monthly administration. They both had a high level of agreement on the second round (100% and 90% respectively) and would be considered as an essential standard if the threshold for consensus was reduced. Other published Delphi studies have used a lower threshold than 80% (Aljamal et al, 2016) and this would have influenced the final results. None of these standards are listed in the four key national publications and this supports their exclusion as essential standards in this study.

Interestingly the standards, D6 (reason for a change in medication, 50%) and D4 (allergies, 68.75%) had a low level of agreement after round one and were classified as desirable standards rather than essential. These standards were listed in all four of the national resources. It is unclear why the expert panel members in this study did not classify these as essential standards. It may be that the respondents felt that the changes in medication would be self-explanatory from the overall discharge summary narrative or the allergies are already known from other sources of information. This would be an interesting area

to follow-up in a larger study. Many of the other desirable standards would be considered as non-core information and their inclusion would be a bonus to the GP.

2.3.1 Strengths

The essential and desirable standards were agreed based on published resources from national organisations. The local experts included practising senior doctors and pharmacist experts' representative of secondary and primary care reflecting real-world knowledge and practice. This approach therefore strengthens the face-validity of the study.

The process used followed a structured, recognised procedure to reach a consensus. Opinions of all the panel members could be expressed in an anonymous manner and represented a clinically relevant view. None of the standard statements was considered inappropriate by the expert panel members. Using an on-line questionnaire facilitated access to responses and analysis in a manageable and straightforward manner. Therefore, the e-Delphi technique was considered appropriate to gain consensus in this study.

2.3.2 Limitations of Phase I

The main limitation of Phase I was that the number of respondents decreased from 16 (55.2%) in round one to 10 (34.5%) in round two. The results from round two may therefore not represent the views of all the expert panel members, which impacts on the validity of the study.

The use of an on-line questionnaire assumes that panel members should have ready access to their email accounts to be able to respond to the questionnaire. It is not known if this was the case for the participants for all rounds of the study and may account for the reduced response rate in round two. A reminder email was sent to panel members after a few weeks of initial circulation to encourage completion of the questionnaire and improve the response rate. A recommendation has been made to try and motivate panel members to ensure that response rates are as high as possible (Hsu and Sandford, 2007). It is recommended for a future development that the reliability and validity of the standards should be reassessed by using a larger number of panel members and using a different healthcare system(s) over a wider geographical area.

Panel members were purposely recruited and briefed by the principal investigator in advance of the study which may have introduced some bias as they were already engaged with the study, as opposed to any members recruited without a briefing who may have given different responses.

A larger sample size and being carried out in more settings would provide more confidence and generalisability of the standards. The adoption of an e-Delphi study across multi-sites would also be a more credible evidence-base to influence the recommendation to improve the quality of discharge summaries in the future by adoption of these findings.

The question for essential standard E7a ie record all medicines that were stopped during the hospital stay, should have also stated medicines started (E7b). This was an oversight and further analysis assumed that the panel members would have answered this in the same way as when a medicine had been started as it is an action of similar significance. In a similar manner the questionnaire asked for the expert panel member to indicate a reason for a change in medication but not whether they wanted to see a change in medication indicated on the discharge summary.

It is acknowledged that the use of the Delphi technique may not reflect a true consensus but rather a compromise position (Yousuf, 2007) and reflect the opinions of participants in this study (Keeney et al, 2001). This is a further justification to carry out a larger study to provide greater generalisability of the results.

The setting of the Delphi study was based around a single non-teaching hospital in a rural county in England. The size (29 panel members) and composition of the expert panel met the criteria as stated by Wilkes (2015) for a Delphi study. The members were all specialists with an interest in the subject matter. However, the expert members may have been biased and not represent the views of all GPs or hospital consultants with varying levels of experience.

Many of the essential standards identified in the study reflect national published standards and a larger study would increase the reliability, generalisability and validity of these findings (SIGN, 2012; RPS (2012)).

This preliminary study therefore forms the basis of further research. Furthermore, the membership of the expert panel included only one lay person and so the views and perspectives of patients on the content of a quality discharge summary in relation to medication was limited. This is a limitation of the study in terms of considering the views of patients or carers themselves. Indeed, the PRSB in their recent report on an e-discharge standard for electronic systems state that any local implementation should involve patients and carers to ensure that the content is expressed in an understandable and person-centred manner (PRSB, 2017). There is an opportunity to proactively include patients in future studies about the value and needs of a 'gold standard' discharge summary in relation to medication.

2.3.3 Implications for practice, policy and research

This preliminary e-Delphi study provides a method to obtain consensus based on UK published literature and local expert opinion for a 'gold standard' discharge summary for medication-related information. The implications are that this should influence both local and national practice and policy. The adoption of both local and national 'gold standards' would contribute to improving the quality of care to patients. The differentiation between essential and desirable standards provides a pragmatic assessment of what the core requirements of a discharge summary are when resources and time are limited in everyday clinical settings. However, by defining the desirable standards this provides guidance if time and resources are available. These details could be included in the discharge summary by others and not just the doctor eg pharmacist or nurse.

This study also informs the need for the consistent adoption and application of a 'gold standard' for discharge summaries in relation to medication in the UK. This includes the recommendation to include the essential 'gold standard' elements into the design and content of HEPMA functionality across the UK. This will reduce any latent failures in the production of discharge summaries by designing the electronic templates to include the standards and to potentially make them mandatory to complete (see also Chapter 5).

The concept of a 'gold standards' of essential and desirable standards develops the ethos of quality improvement in healthcare. There is the ability to develop comparisons between, and within, organisations to facilitate hospital performance indicators for quality of discharge information. This could be used between commissioners and host

organisations as part of a quality improvement initiative or as a performance management tool. Future research could focus on seeking to identify gaps in practice and to encourage training and process re-design to address any deficiencies found.

It would also be an area of future research to assess the generalisability and applicability of 'gold standards' to other types of healthcare settings which may have their own discharge requirements that are different to a standard acute hospital eg mental health hospital or children's hospital.

The consensus of the local standards also allowed Phase II of the study to be carried out measuring the level of adherence with the gold standards to give a measure of the quality of discharge summaries in relation to medication-related information.

Chapter 3: Adherence to 'gold standard' discharge summary in elderly patients discharged from hospital (Phase II study)

3.0 Chapter overview

In chapter two, Phase I of the study described the modified e-Delphi technique used to produce the essential or 'gold standards' for a discharge summary related to medication. The essential standards found are shown in table 9.

Table 9: Essential standards identified in Phase I of the e-Delphi study

Essential standard	Code
Route of administration	E1
Duration if a course	E2
Generic name stated	E3a
Dose stated	E3b
Frequency stated	E3c
Strength specified	E4a
Formulation	E4b
Duration of long term specified	E5
Monitoring or review required specified	E6
Record of medication stopped	E7a
Record of medication started	E7b

A measure of the level of adherence to the local essential or gold standards and desirable standards from the hospital discharge summary established from Phase I for medication-related information was carried out. Primary objectives were to describe and categorise the type and extent of medication-related information in the discharge summary. To determine the extent to which the GP has acted upon the information in the discharge summary in the patient's primary care records. Also, to consider whether there are any variables that may influence the quality of the discharge summary and measure how many patients were readmitted within 30 days after discharge for Phase III of the study. Elderly patients' discharge summaries who were discharged from care of the elderly wards at the study hospital were retrospectively reviewed for demographic and medication-related information.

Where reference is made to methodology or results obtained from this study it will be referred to as 'current study'.

3.1 Method

3.1.1 Setting

The pilot study was carried out by collecting data of patients ≥65 years of age, discharged from care of the elderly wards at The Ipswich Hospital NHS Trust, a local district general hospital which serves the population of East Suffolk, with approximately 550 beds. Patients discharged from this hospital and based in Suffolk were followed up with their local GP records.

3.1.2 Pilot study

A standardised data collection form was developed based upon the essential and desirable standards identified from Phase I of the study. A pilot study of the data collection tool was carried out to assess content and face validity of collecting data for the medication-related details of the discharge summaries for coding and content analysis. Two senior clinical pharmacists reviewed six patients to test the data collection form for ease of use and applicability (see Appendix 1). The form was modified to include the type of the doctor or prescriber writing the discharge summary and to re-format the details of the list of medications the patient was discharged on to make the data collection clearer to analyse.

3.1.3 Sample selection

The patient sample comprised of patients discharged from a care of the elderly ward at the study hospital and were over the age of 65 following an emergency admission. Patients were included in the study if they had been an inpatient for more than 48 hours or if they had been an inpatient for less than 48 hours but had all their medication prescribed on the discharge summary. The discharge policy at the study hospital is that all medicines should be prescribed for a patient on discharge if they are an inpatient for more than 48 hours. The patient's discharge summary was located on the hospital electronic health records called Evolve®. Additionally, after 30 days the patient's GP records were accessed to ascertain the quality of information related to medicines in the

GP records using SystmOne®. Patients who had died within 30 days of discharge were also excluded from the study sample.

SystmOne® is a commercial software package often used in primary care by GP practices with an electronic health record function. Patient data can be shared securely across services including between GP practices and hospitals, providing details of medicines that a patient has been prescribed. This is a crucial patient safety service as it enables clinicians to be able to access patient clinical information 24 hours a day. The principal investigator was already familiar with the use of SystmOne®.

Patients from the study hospital were identified by the principal investigator using a software package called Medeanalytics®. Medeanalytics® is a commercial information technology system that allows analysis of data including hospital discharge data. Random searches were generated on the Medeanalytics® system of patients discharged from identified care of the elderly wards at the study hospital over a six-month period from January to June 2016.

Figure 6 illustrates the process for identifying the sample population of patients in Phase II of the study, and also, the subsequent data collection and analysis of patients who have been readmitted within 30 days of discharge due to a medication-related cause.

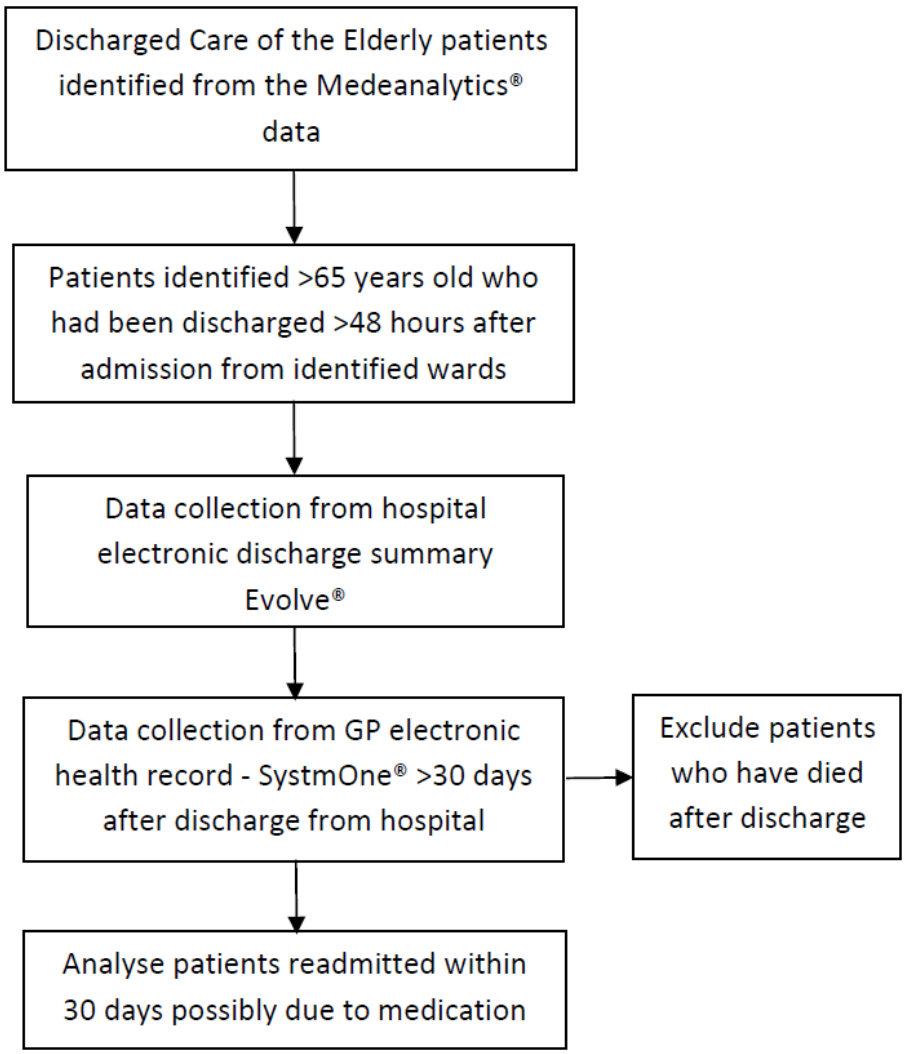

Figure 6: The process for data identification, collection and analysis of Phase II of the study

3.1.4 Data collection

Retrospective data was collected manually on a standardised data collection form previously piloted using a combination of both patient demographic data of the sample population and collecting the medicines-related information on the discharge summary aligned to the essential and desirable standards from Phase I of the study.

Phase II was a pilot study to establish some of the approaches when undertaking a study of this type and to inform a future larger study, so a power calculation was inappropriate.

The data collected was composed of both pre-populated data including the ward, date of admission and date of discharge, as well as the medication-related information that had been manually inputted. Data was collated using Microsoft Excel® and analysed using the Statistical Package for Social Sciences (SPSS) Windows version 24.

The discharge summary of all the patients in the study identified the main diagnosis that was found as part of the inpatient episode of care. This was subsequently coded according to the International Statistical Classification of Diseases and Related Health problems, 10th revision (ICD-10): 2015 classification and is the recognised medical classification list created by the World Health Organisation (WHO) and contains codes for diagnoses (WHO, 2017).

3.1.5 Co-morbidity profile

The type of other conditions or co-morbidity profile of the study patients was collected. This was collected to gain an understanding of the level of ill health and can be used to calculate the Charlson Co-morbidity Index. Data was collected direct from the description on the discharge summary of the co-morbidities listed by the discharging doctor. These were not verified but taken as reflecting the co-morbidities known during the patient's current inpatient admission.

3.1.6 Charlson Co-morbidity Index (CCI)

The CCI is a predictive tool used to estimate an individual's likely survival based on several parameters including their co-morbidities. For example, for a score of four there is a probability of 52% mortality one year after hospital admission, whilst a score of five or more would give an 85% risk of mortality one year after hospital admission (Hall et al, 2004). The CCI calculator is available as a Microsoft Excel tool from the publication from Hall et al, (2004) and was used in this current study to calculate the CCI.

3.1.7 Ward of discharge

The wards chosen for the study sample were known as care of the elderly wards at the study hospital. These are all in the medicine and therapies division and all have a nominated lead consultant.

3.1.8 Day of discharge

The day of the discharge was coded from the date indicated on the discharge summary although it is recognised that on some occasions this may be the next working day after discharge. The agreed policy for discharge at the study hospital is for the patient to be issued a paper copy of the final discharge summary at the point of discharge from the hospital Patient Administration System (PAS). However, in some cases, particularly at weekends, the final discharge on the PAS may occur later than the actual discharge and indicate a different day of discharge. It is known by the principal investigator that this only occurs occasionally.

3.1.9 Length of stay

The length of stay was calculated from the date of admission and compared with the date of discharge related to the inpatient episode of care indicated on the final discharge summary following the episode of care. Part days were counted as one day.

3.1.10 Demographic details

Data collected from the discharge summaries of the study group was composed of pre-populated data including the patient demographic details and name of the lead consultant. Also, the clinical narrative describing the main diagnosis, secondary diagnosis or co-morbidities, relevant investigations and results and the name and grade of the person who prepared these details on the discharge summary were reviewed. The date of completion and details of the medication verification by a pharmacist are also included. The consultant indicated on the discharge summary is the lead consultant who was responsible overall for the patient during their inpatient stay and is automatically populated from the hospital PAS.

3.1.11 Prescriber preparing discharge summary

The discharge summary that was generated provides an electronic signature of the doctor or non-medical prescriber undertaking the activity and their grade or designation.

The discharge summary produced on the Evolve® system requires clinical information to be inputted manually by a clinician. This is most commonly a doctor but may in some cases be a specialist nurse with prescriber status and authority. In the UK the medical or doctor career structure is defined by the General Medical Council (GMC) and was reviewed in 2005 (BMA, 2017). Once a medical graduate completes medical school (four to five years) they will enter a two-year foundation programme namely FY1 (Foundation Year 1) which replaced the previous pre-registration house officer year. They then move onto FY2 (Foundation Year 2) which was previously known as the Senior House Officer (SHO) grade working in a hospital environment. Following completion of these two years the doctor has full GMC registration. This is then followed in hospitals with three to seven years of Specialist Training (ST) dependant on the speciality and these are then referred to as ST1, ST2, ST3 etc, noting the number of years of specialist training undertaken. The doctor may then receive a certificate of completion which then allows them to work as an independent practitioner either as a consultant or GP. There are also doctors who have achieved a level of training that they stay working at. These are referred to as staff grade, trust grade or non-consultant doctors. These are collectively known as non-career grade doctors (NCGD) and coded as such in this study. NCGD doctors have no on-going training requirement.

For the purposes of the current study the following codes were used for the prescriber type and are defined in Table 10.

Table 10: Definitions of types of prescribers writing the discharge summary

Prescriber type	Definition
Nurse	Nurse registered with the Nursing and Midwifery Council and has undertaken an accredited prescribing course.
FY1	Foundation Year 1
FY2	Foundation Year 2
ST1	Specialist Training Year 1
ST2	Specialist Training Year 2
ST3	Specialist Training year 3
Consultant	Consultant
NCGD	Non- Career Grade Doctor

3.1.12 Hospital readmission

Patients in the study were followed up at least 30 days after discharge to determine if they were readmitted for any reason. This was carried out by examining the hospital electronic PAS to establish readmission or not. All patients were included in this data collection aspect at this stage irrespective of the reason for readmission. Patients were excluded if they had attended the Accident and Emergency department or other similar acute admission/assessment service but not admitted.

3.1.13 Pharmacy-led medicines reconciliation (PMR) on admission

The presence of a pharmacy-led medicines reconciliation service was measured. This is when an approved pharmacy staff member (pharmacist or accredited pharmacy technician) undertakes medicines reconciliation (MR) during the patient's episode of care. This is ideally undertaken within 24 hours of admission. This activity ensures there is a reconciliation or check of the patient's medicines prior to admission compared to those prescribed whilst an inpatient and aims to reduce the number of unintentional medication discrepancies as an inpatient. This data was collected by reviewing the study patients' health records, which includes the inpatient medication chart. This medication chart is annotated by a member of pharmacy staff on the front if they carry out a MR activity so there is evidence of whether a PMR has been carried out and when this occurred. The medication chart will also provide evidence if any unintentional discrepancies were identified as part of the MR service and whether they were acted upon.

3.1.14 Allergy status on discharge summary

The information related to allergy status on the discharge summary was coded by whether the data was entered or not and if a description was given or not if applicable. The discharge summary has a field which is generated automatically titled 'Allergies/Adverse Drug Effects' and was coded whether data was entered or not. The abbreviation 'NKDA' stands for No Known Drug Allergy and would be coded that the allergy status had been considered but no allergies identified.

3.1.15 Discharge medicines

The numbers and types of medicines on the discharge summary was taken directly from the discharge summary on the Evolve® system which keeps all previous discharge summaries as part of the patient's electronic health record whilst an inpatient in hospital.

The classes of medicines were coded according to the World Health Organisation (WHO) classification. This utilises the Anatomical Therapeutic Classification (ATC) and the Defined Daily Dose (DDD) as the measurement units and has been established as the standard for comparing medicines in research and use in a standardised manner (WHO, 2017).

3.2 Ethical approval and considerations

The leads for research and information governance for the study hospital agreed opinion that ethical review of the study was not required because it met the criteria of a service evaluation. The study was given clinical approval in April 2015 by the local CQIT group of senior clinicians and officers of the study hospital and local CCG. The hospital information governance lead was also consulted about the need for consent to access the patients' GP records or summary care record (SCR). It was confirmed that as this was part of normal clinical practice at the hospital as part of the medicines reconciliation processes, that consent was not required. Data was kept confidential and under the secure control of the principal investigator. If during the data collection period the principal investigator found a medication discrepancy that was unintentional on the discharge summary that could affect patient safety and care, they would contact the patient's GP to notify them of any discrepancies so that they could assess if any further action needed to be taken.

3.3 Calculation of adherence level to the gold standards

To provide a measure of the level of adherence or performance to the essential or 'gold standards' a calculation was undertaken based on previously published methodology.

Aziz el al, (2016) carried out a retrospective audit of adherence with the national standards for patient discharge information in Ireland. The adherence was broken down into three main categories namely; patient demographic and discharge information, medication information, and adherence relating to therapy change information.

Adherence was assessed in a binary 'yes/no' response. Thus, a discharge summary was considered completely compliant if a 'yes' or 'N/A' was recorded for each selected criterion or element. The score was calculated by summing the number of elements that were rated as compliant (including non-applicable criteria) divided by the number of applicable elements for each discharge summary; multiplied by 100. In a similar study Hammad et al, (2014) undertook a study to measure the compliance or adherence for discharge information. This study used the National Prescribing Centre (NPC) minimum dataset of information that is required to be transmitted to primary care. The estimation of adherence of the discharge summary to the NPC dataset was undertaken using a scoring system. Discharge summaries scored one point when a criterion was successfully fulfilled. Two points were scored for each criterion not fulfilled. Discharge summaries for patients with no medication history or where no medicines were changed, initiated or discontinued were scored only against the applicable criteria. In a similar manner to the study by Aziz et al, (2016) the NPC minimum dataset criteria were broken down into three categories; patient admission and discharge information, medication information and therapy change information.

In this current study the essential standards identified in the modified e-Delphi component considered only the medication-related elements of the discharge summary. This contrasts with the previously reported studies. A comparison undertaken identified that the following essential and selected desirable standards can be categorised into the following two groups as per Aziz et al, (2016) and Hammad et al, (2014) and is shown in Table 11.

Table 11: Categories of the essential and selected desirable standards

Categories	Essential standard-element	Code
Medication Information	Route	E1
	Duration	E2
	Name	E3a
	Dose	E3b
	Frequency	E3c
	Strength	E4a
	Formulation	E4b
	Long term treatment	E5
	Monitoring or review requirements	E6
Therapy change	Record of stopped (or started) medication (*)	E7a, E7b
	Reason stated for a medication stopped (or started)	D5a, D5b
	Reason stated for medication change	D6

Notes:

(*) Denotes the inclusion of medicines started as well as stopped on the discharge summary (E7b). This standard was not included in the original dataset for the e-Delphi study but it is expected that the same response would have been obtained for newly started medicines.

In Table 11, reasons for changes in medicines has been included as standards that have been considered in other studies and it would be worth considering in this study (Aziz et al, 2016; Hammad et al, 2014).

The method adopted by Aziz et al, (2016) was adapted and utilised to estimate the extent of adherence with the essential standards for the discharge summaries in the study and therefore a measure of the gold standard. So, for each essential standard that was met a score of one was recorded. If the essential standard was not applicable this was excluded from the total score possible. A total score was calculated for each of the essential standards met. All the medicines should meet the criteria for a score to be assigned. For example, if only four out of six medicines that were applicable had long term treatment denoted on the discharge summary then no score was given for this standard. An overall percentage adherence was calculated based on the standards being met against those that were applicable for all the essential standards or the 'gold standards'. An overall adherence score was also calculated for the additional desirable standards indicated in Table 11 ie the standards that relate to reasons for a medicine being stopped, started or changed. These were included to allow some comparison with other published studies (Aziz et al, 2016; Hammad et al, 2014).

3.4 Data analysis and plan

A data analysis plan was developed to include demographic, patient and medication variables.

Data analysis of the sample patients was composed of descriptive statistics to summarise and describe the results of the medication-related content of the discharge summaries. The level of adherence to the 'Gold standards' was stated as a percentage.

The analysis was undertaken to determine if there was an association between the influence of various variables, see section 3.13, and the quality of the discharge summary adherence score using a probability (p) value of ≤0.05. Where multiple variables are compared a more stringent level of p was applied of 0.01.

Analysis for comparing differences between sets of data was undertaken using the following to test an association with the variables:

The mean and standard deviation describe data that is normally distributed. The independent samples t-test (to test the probability that the samples come from a population with the same mean value), Analysis of Variance (ANOVA) (to compare the means of more than two groups that come from the same population) eg length of stay and the Pearson's correlation (r) were used when looking for an association between variables eg number of medicines started and number of medicines discharged on.

The median and interquartile range (IQR) describe the data where the sample size is smaller or where there is non-normal distribution eg number of co-morbidities and also other non-parametric tests such as the Mann Whitney U test (to test if there is a significant difference between two sets of data from two different sets of subjects) eg influence of therapeutic classes and the adherence score, the Chi-square test (X^2) to test the association between two categorical values eg ADE and gender and the Kruskai-Wallis test to compare more than two groups eg number of medicines on discharge and the adherence score.

3.5 Results

3.5.1 Summary of results

A summary of the results to describe the demographic details and essential and desirable standards for 155 patients is shown in Table 12.

Table 12: Summary of the results

Details	Description	Result
Demographic and medication		
	Total number of patients	155
	Mean age (years)	83.17(+/- SD 8.22)
	Total number of medicines prescribed	1470
	Mean number of medicines per patient	9.48(+/- SD 3.99)
	Median number of medicines	9 (IQR 7-12)
	Mean length of stay (days)	13.17(+/- SD 12.62)
	Median length of stay (days)	10 (IQR 5-18)
Essential standard		**(%)**
E1	Route of administration	1465/1470 (99.7)
E2	Duration if a course	96/96 (100)
E3a	Generic name stated	1370/1470 (93.2)
E3b	Dose stated	1463/1470 (99.5)
E3c	Frequency stated	1465/1470 (99.7)
E4a	Strength specified	88/1470 (6.0)
E4b	Formulation specified	74/1470 (5.0)
E5	Duration of long term specified	1374/1470 (93.5)
E6	Details of monitoring or review required specified	44/155 (28.4)
E7a	Record of medication stopped	70/155 (45.2)
	GP records not updated of medicines stopped	19/130 (14.6)
E7b	Record of medication started	131/155 (84.5)
	GP records not updated of medicines started	17/335 (5.1)
Desirable standard		
D1	Details of Adverse Drug Event specified	21/155 (13.5)
	GP records not updated of Adverse Drug Events	12/33 (36.4)
D2	Details of date and last dose given	34/155 (21.9)
D3	Details of no medication prescribed	Not applicable
D4	Allergy status specified	119/155 (76.8)
D5a	Reason for medication stopped	98/130 (75.4)
D5b	Reason for medication started	284/335 (84.8)
D6	Reason for a change to medication	23/45 (51.1)
	GP records not updated of medicines with a change in dose	4/45 (8.9)
D7	Details of adherence problems stated	5/155 (3.2)
D8	Contact details given of whom to contact	3/155 (1.9)
D9	Reason or indication specified	287/1470 (19.5)
D10	Details of verbal advice provided	1/155 (0.6)
D11	Details of compliance aids provided	56/155 (36.2)
D12	Other relevant contacts provided	55/155 (35.5)
D13	Details of written information provided	4/155 (2.6)
	Overall adherence score for essential/gold standards (SD)	**64.63 (9.25)**

3.5.2 Demographic and medication characteristics

The study sample of 155 patients had a mean age of 83.17 years, (median age 85 years), and median of four co-morbidities due to the non-normal distribution. Sixty four (41.3%) were male (see table 13).

The mean number of medicines was 9.48 per patient with a tendency for male patients to be on more medicines than females (mean 10.06 for male compared with 9.08 for female patients). There was no statistical difference using the independent samples t-test (t=-1.52) for the number of medicines and gender (p=0.130). A total of 1,470 medicines were prescribed on the discharge summaries with 644 (43.8%) for male patients.

Table 13: Demographic and Medication characteristics of the study population

Demographic and medication characteristics		Result - all	Result - male	Result - female	Range (All)
Patients	Frequency (%)	155 (100)	64 (41.3)	91 (58.7)	
Age (years)	Mean (SD)	83.17 (8.21)	83.02 (7.84)	83.29 (8.51)	61-99
Number of co-morbidities	Median	4 (IQR 2-5)	4 (IQR 2-5)	3 (IQR 2-4)	0-10
Charlson Co-morbidity Index (CCI)	Median	6 (IQR 4-7)	6 (IQR 4-7)	6 (IQR 4-7)	0-11
Total number of medicines at discharge	Frequency (%)	1470 (100)	644 (43.8)	826 (56.2)	
Number of medicines per patient at discharge	Mean (SD)	9.48 (3.99)	10.06 (4.20)	9.08 (3.80)	1-22

3.5.3 Diagnosis type and co-morbidities of patients

The types of main diagnosis and co-morbidities for the patients in the study were classified using the International Statistical Classification of Diseases and Related Health Problems (10th Revision) (ICD-10) and grouped into the most common diseases and is shown in Table 14.

Table 14: Main diagnosis of patients in the study

Primary diagnosis of patients	Number (%)
Diseases of the Respiratory system	50 (32.2)
Diseases of the Circulatory system	24 (15.5)
Syncope and Collapse	20 (12.9)
Diseases of the Genitourinary tract and system	17 (11.0)
Infectious diseases	9 (5.8)
Diseases of the Nervous system	8 (5.2)
Diseases of the Blood	4 (2.6)
Diseases of the Digestive tract	4 (2.6)
Diseases of the Musculoskeletal system	4 (2.6)
Endocrine, Nutritional and Metabolic disorders	3 (1.9)
Mental and Behavioural disorders	3 (1.9)
Neoplasms	3 (1.9)
Other	6 (3.9)

The most common diagnoses in the patient group were diseases of the respiratory system 32.2% (n=50) of which pneumonia accounts for 14.8% (n=23). Also, circulatory system 15.5% (n=24), syncope and collapse 12.9 % (n=20) and respiratory tract infection 10.3% (n=16).

A total of 552 co-morbidities were recorded for the 155 patients with a range of 0 to 10. The median number of co-morbidities was four for all patients (IQR 4-7), four for male patients (IQR 4-7) and three for female patients (IQR 2-4).

Figure 7 shows the skewed distribution of the number of co-morbidities versus percentage of patients. This is because the study sample is a pre-selected elderly group and likely to have a different distribution of co-morbidities compared with a general population sample.

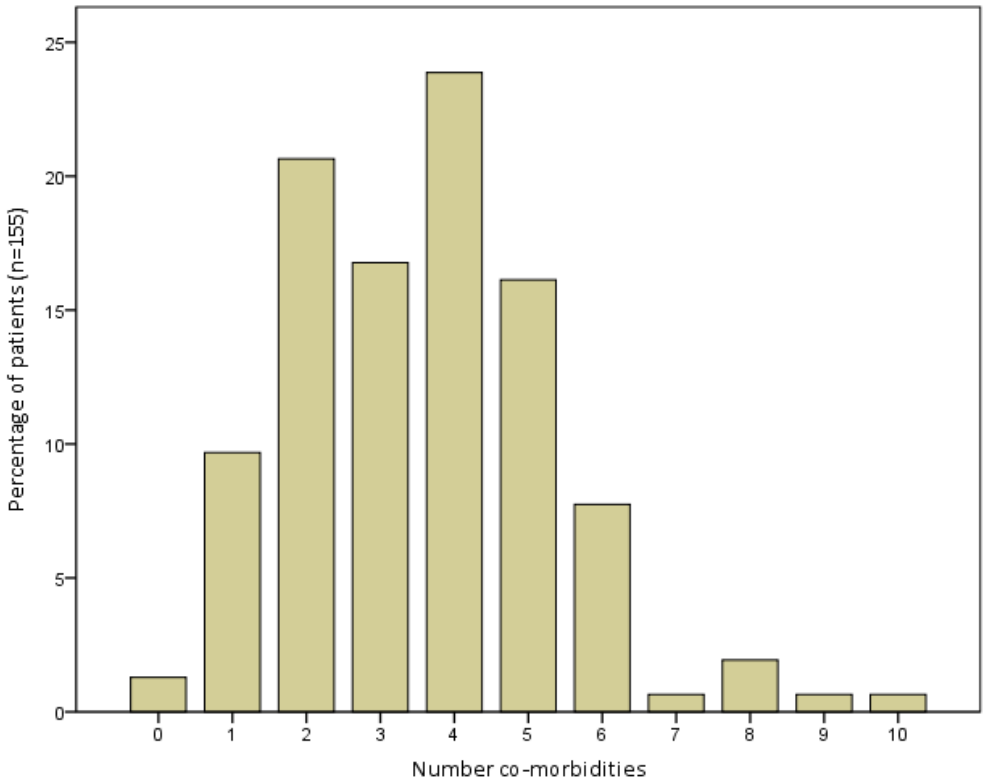

Figure 7: Distribution of number of co-morbidities versus percentage of patients in the study (n=155)

The types of associated co-morbidities for the 155 patients in the study were also classified using the ICD-10 WHO definitions and the results are indicated in Table 15.

Table 15: Profile of the associated co-morbidities

Profile of associated co-morbidities	**Number of occurrences (%)**
Diseases of the Circulatory system	204 (36.9)
Endocrine and Nutritional disorders	63 (11.4)
Diseases of the Musculoskeletal system and Connective tissue	61 (11.1)
Diseases of the Respiratory system	39 (7.2)
Diseases of the Genitourinary system	38 (6.9)
Mental and Behavioural disorders	38 (6.9)
Diseases of the Nervous system	33 (6.0)
Miscellaneous eg electronic cardiac device	18 (3.3)
Neoplasms	17 (3.0)
Diseases of the Eye	16 (2.9)
Diseases of the Digestive system	13 (2.3)
Diseases of the Ear	5 (0.9)
Diseases of the Skin and Subcutaneous tissue	4 (0.7)
Diseases of the blood	3 (0.5)

3.5.4 Charlson Co-morbidity Index results

The median Charlson Co-morbidity Index (CCI) was six (IQR 4-7) for all patients, for male patients six (IQR 4-7) and female patients six (IQR 4-7). This represents a cohort of study patients with a high likelihood of death within one year. There is a bi-modal distribution as 23 (14.8%) of patients have a CCI score of zero.

The frequency of patients against CCI score is indicated in Figure 8.

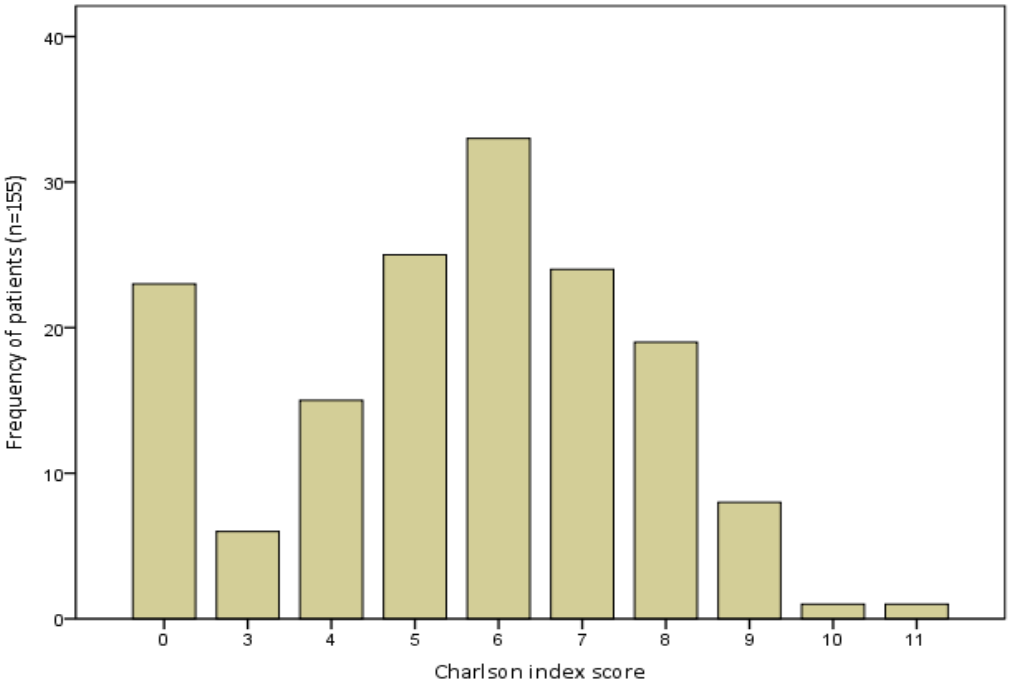

Figure 8: The Charlson Co-morbidity Index (CCI) score versus the frequency of number of patients (n=155)

3.5.5 Ward of discharge

Most patients (26.4%) were discharged from ward W6 because at that time of the current study this ward was operating as a pre-discharge ward. Patients were medically fit for discharge and waiting for social care packages to be set up, and therefore were waiting for discharge on this ward. It is interesting to note that when the ward of discharge is broken down by gender that more females are discharged from W6 compared to males. It was felt important to report on the ward of discharge to ensure there was no skew in the data due to differences in the medical teams that were responsible for these areas. The profile of wards that the patients were discharged from is shown in Table 16.

Table 16: Profile of the patient discharge characteristics by ward

Elderly Ward code of discharge	Number of discharges (%)	Number of male patients (%)	Number of female patients (%)
W1	24 (15.5)	11 (7.1)	13 (8.4)
W2	20 (12.9)	8 (5.2)	12 (7.8)
W3	26 (16.8)	19 (12.2)	7 (4.5)
W4	20 (12.9)	9 (5.8)	11 (7.1)
W5	24 (15.5)	6 (3.9)	18 (11.6)
W6	41 (26.4)	11 (7.1)	30 (19.3)
Total	**155 (100)**	**64 (41.3)**	**91 (58.7)**

3.5.6 Day of discharge

The day of discharge may be a factor that affects the quality of discharge information. Only 6.5% (10) of the patients were discharged over the weekend. This may explain the higher number of patients discharged on Monday (28.4%) and Tuesday (17.4%) due to the pressure to discharge patients following admission as an emergency over the weekend.

The profile of the number and percentage of patients discharged by day of the week is shown in Table 17.

Table 17: Number of patients discharged according to the day of discharge

Day of discharge	Number of patients discharged (%) (n=155)
Monday	44 (28.4)
Tuesday	27 (17.4)
Wednesday	25 (16.1)
Thursday	23 (14.8)
Friday	26 (16.8)
Saturday	7 (4.5)
Sunday	3 (2.0)

3.5.7 Length of stay

The mean length of stay was 13.17 days and median length of stay was ten days (IQR 5-18) with a minimum of one day for one patient (this patient was included in the dataset as all the medication was included on the discharge summary) and a maximum of 84 days for one patient. The median length of stay for males was seven days (IQR 4-19) and 10 days for females (IQR 5-18). There was no significant difference between male and female length of stay using the Mann Whitney U test (U=2651.5) and p=0.343.

Figure 9 shows the non-normal distribution of length of stay for the study group.

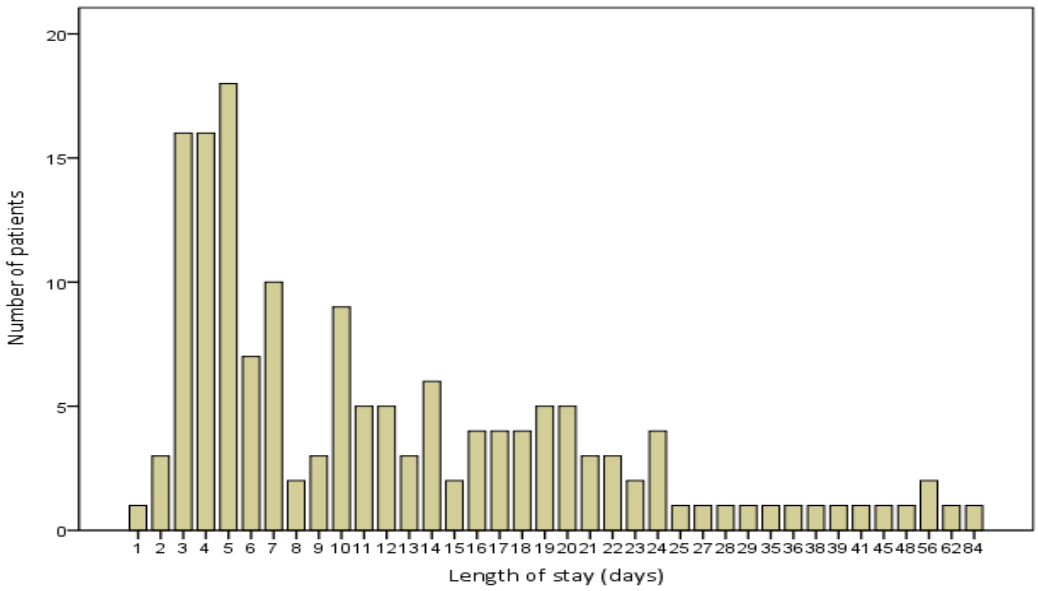

Figure 9: Distribution of length of stay versus the number of patients (n=155)

3.6 Preparation of the discharge summary

3.6.1 Prescriber types

Most of the discharge prescriptions were written by a junior doctor at Foundation Year Level 1 (FY1) (43.9%) and Foundation Year level 2 (FY2) (27.7%) (total 71.6% for both). Only six (3.9%) of the discharge summaries were written by a consultant. No discharge prescriptions were written by a pharmacist. The non-career grade doctors (NCGD) account for 17.4% of all discharge summaries written. The NCGD are permanent, unlike junior doctors at FY1 and FY2 levels. The skewed distribution of the types of prescribers who prepared the discharge summary against the percentage of discharge summaries is shown in Figure 10. NCGD are shown as a group together.

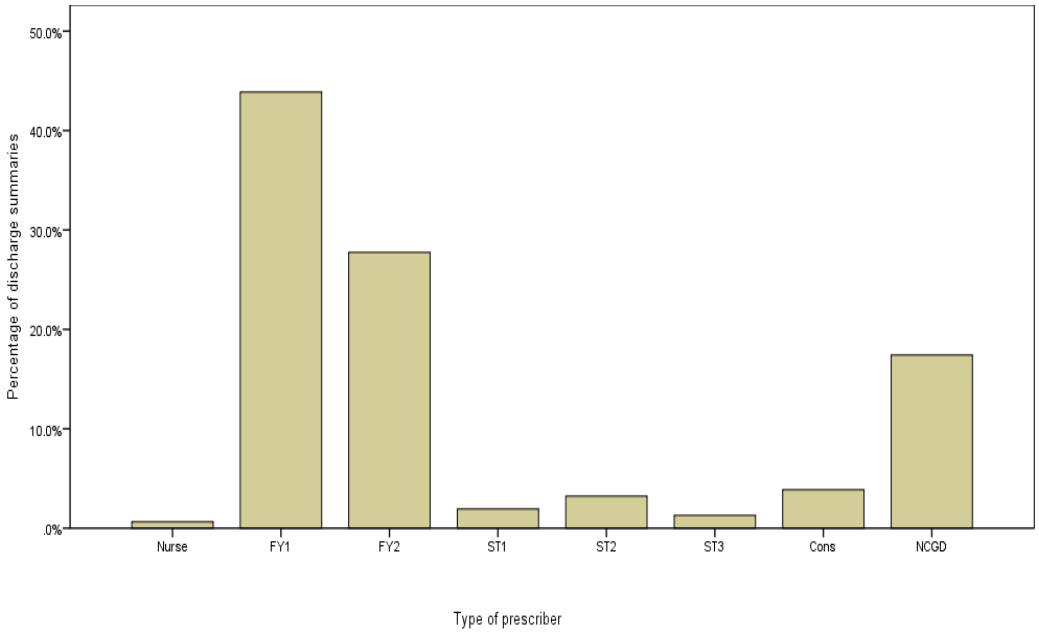

Figure 10: Type of prescribers generating a discharge summary against the percentage of the total written (n=155)

3.7 Readmission to hospital within 30 days of discharge

Of the 155 patients in the study, 31 (20%) of patients were readmitted within 30 days for a variety of reasons, 17 (54.8%) were female and 14 (45.2%) male. The demographic details of these patients are shown in Table 18.

Only six (3.9%) of the 31 readmissions were potentially due to medication ie four female and two males. Two of the discharge summaries were written by a FY1 level doctor, two by ST1 level and two by NCGD doctors. All patients had a pharmacist verification and five had a pharmacy-led MR undertaken. This part of the analysis will be explored in more detail in Phase III of the study (see Chapter 4).

Table 18: Demographic details of patients readmitted

Details of patients readmitted within 30 days of discharge (n=155)	Result (%)	Potential number of patients readmitted possibly due to medication (%)	
Age range (years)	61-96		
Number of patients readmitted	31 (20)	6	(3.9)
Male patients readmitted (%)	14 (45.2)	2	(1.3)
Female patients readmitted (%)	17 (54.8)	4	(2.6)
Median number of co-morbidities	4 (IQR 2-5)	-	
Median number of medicines	8 (IQR 6-12)	-	

3.8 Pharmacy service and medication-related information

3.8.1 Pharmacy-led medicines reconciliation (PMR) on admission

Pharmacy staff at the study hospital carried out 140 MRs of the 155 patients during their inpatient stay ie 90.3% occurrence rate. The time of MR in relation to admission was not recorded. The MR would have been carried out by a pharmacist or a MR trained competent pharmacy technician and so the quality of the MR undertaken was the same as the competency standard is the same for both sets of staff. This would be irrespective of when it was undertaken. Also, that any unintentional discrepancies were identified and acted upon. The number of PMR activities per ward is shown in Table 19. There is little variation between the wards in the study apart from ward W6 which was a pre-discharge ward at the time of the study.

Table 19: Profile of pharmacy led medicines reconciliation services per ward

Pharmacy led MR	Total (%) (n=155)	W1	W2	W3	W4	W5	W6
Yes	140 (90.3)	22	18	22	15	22	41

3.8.2 Pharmacist verification

A procedure that is carried out prior to discharge is the clinical verification or validation of the discharge summary medication component for accuracy by a pharmacist. This ensures that any unintentional discrepancies are corrected prior to the actual discharge of the patient. This verification can be carried out electronically and remotely in the dispensary or on the ward of discharge. The number of discharge summaries that were

verified for accuracy by a pharmacist prior to discharge was 148 (95.5%). Of the seven (4.5%) patient discharge summaries that were not verified by a pharmacist, no patients were readmitted for a medication-related reason.

3.8.3 Profile of types of discharge medicines on discharge

The total number of medicines in the study at discharge is 1,470. The median number was nine (IQR 7-12) and the mean was 9.48 (SD=3.99) with a range 1 to 22. Figure 11 illustrates the distribution of the number of medicines on the discharge summary against the frequency of this occurring.

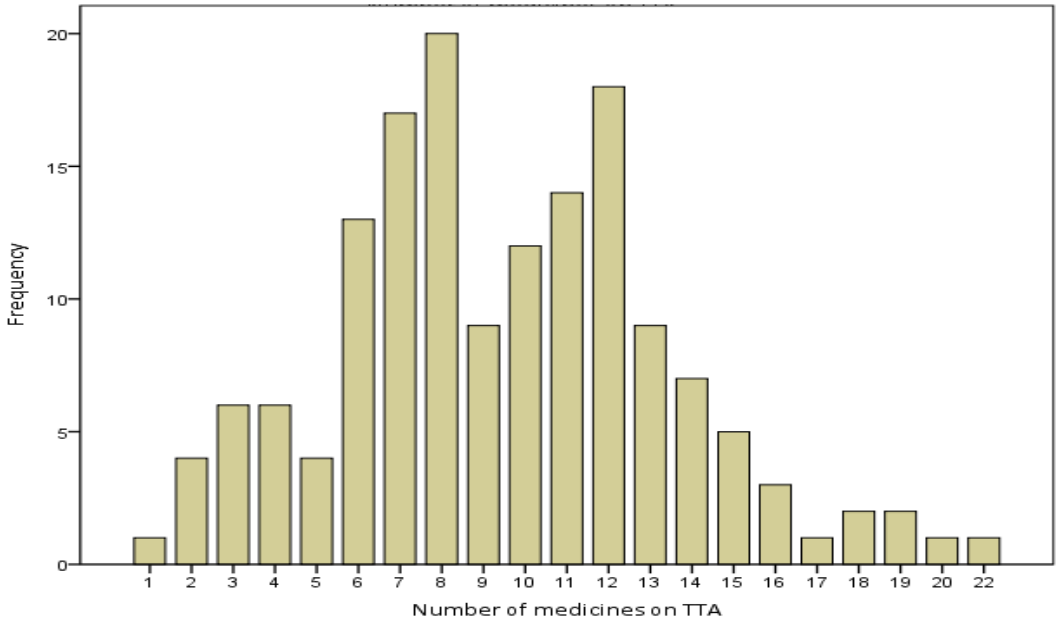

Figure 11: Number of medicines on the discharge summary against the frequency of this occurring (n=155)

The breakdown of the frequency of therapeutic classes of medicines is indicated in Table 20 using the WHO ATC/DDD classification.

Table 20: Occurrence of therapeutic classes of medicines on the discharge summary

Classes of medicines on the discharge summaries	Number of medicines in class (n=1470) (%)
Alimentary tract and metabolism	338 (23.00)
Nervous system	324 (22.04)
Cardiovascular system	311 (21.15)
Blood and blood forming agents	140 (9.53)
Drugs for Respiratory disorders	105 (7.14)
Antibacterial agents	61 (4.15)
Hormonal preparations	61 (4.15)
Musculoskeletal system agents	41 (2.79)
Ophthalmology agents	28 (1.90)
Urological agents	25 (1.70)
Dermatological agents	24 (1.63)
Miscellaneous agents	7 (0.48)
Anti-neoplastic agents	5 (0.34)

Some of the therapeutic classes of medicines are at an increased risk of causing adverse effects in elderly patients (Tangiisuran et al, 2010). This is because the medicines may have a low therapeutic index or have a greater risk of side-effects due to increased sensitivity in the elderly population. These classes include agents used for treating dementia and Parkinson's disease which are included in the nervous system class (22.04%), agents used for cardiovascular disease such as diuretics which account for 21.15% of the medicines and anti-thrombotic agents which account for 9.53% of agents in the blood agents class. This means that the agents causing the highest potential risk of an ADE are amongst the common medicines prescribed in this patient group.

3.9 Results for essential or gold standards

The following section of results are broken into the various essential standards E1 to E7 with sub-groups results where they have implications for clinical practice and future policies and procedures. These essential standards would form the basis of a gold standard discharge summary.

3.9.1 Essential standards: Medicine route (E1) name (E3a) and dose (E3b) with frequency (E3c)

Following the Phase I study establishing the essential standards for a quality discharge summary, there were four essential standards that should be clearly stated. These are that the generic name of the medicine, the dose, the frequency and the route of administration are all specified on the discharge summary. The percentage adherence for these standards is shown in Table 21. The total number of medicines in the study was 1,470. There was a high adherence score for standards E1 and E3a, E3b and E3c which provides confidence to the GP that basic information is likely to be received.

Table 21: Percentage adherence of essential standards E1 and E3

Code	Essential Standard	Number	Adherence (%)
E1	Total number of medicines with route specified	1,465/1,470	99.7
E3a	Total number of medicines with generic name	1,370/1,470	93.2
E3b	Total number of medicines with a dose specified	1,463/1,470	99.5
E3c	Total number of medicines with a frequency specified	1,465/1,470	99.7

3.9.2 Essential standard: Medicines duration if a course (E2)

In some cases, it is important that the duration of medicine treatment is specified on the discharge summary to prevent inappropriate long-term prescribing or extended courses of treatment. In 69 (44.5%) patients there was a medicine where the duration needed to be specified. This accounts for 96 medicines and in all cases, this was appropriate and there was also a reason given for the duration so there is 100% adherence for this standard. Forty-five of the patient's details of the duration was in relation to an antibiotic course. The frequency of occurrence of the other reasons for the duration being specified was very low and included reducing doses of steroids for six patients and vitamin D courses for four patients.

3.9.3 Essential standard: Medication with strength specified (E4a)

Clinically, in some cases, it is important to know the strength of the medicine prescribed on discharge in addition to the dose and is an essential standard in this current study. It was found that only 51 (32.9%) patients had any details of the medication strength indicated on the discharge summary out of 155. This was for a total of 88 out of 1,470 medicines or 6.0% of the total. The most common medicines that had the strength specified on the discharge summary were: nine patients for eye drops, 18 patients who were on an inhaled medicine and seven patients were for medicines used for Parkinson's disease. The details for the frequency and number of strengths specified on the discharge summary is given in Table 22.

Table 22: The number of medicines with strength on the discharge summary against frequency

Number of medicines with strength on the discharge summary per patient	Frequency of strengths stated (n= 1,470) (%)
1	25 (1.7)
2	32 (2.2)
3	27 (1.8)
4	4 (0.3)

3.9.4 Essential standard: Medication with formulation details specified (E4b)

In a similar manner to the requirement in some cases to specify the strength of a medicine on the discharge summary, it is also essential to specify the formulation of the medicine prescribed. A total of 74 medicines had the details of the formulation specified on the discharge summary out of 1,470 or 5.0% of the total. Details of the characteristics of the formulation details frequency of occurrence is given in Table 23.

Table 23: Details of the formulations stated on the discharge summaries

Number of formulations stated per patient	Frequency of formulations stated	Total number
1	39	39
2	13	26
3	3	9
Total	**55**	**74**

There were 55 patients who had details of the formulation specified on the discharge summary. The most common details that were mentioned regarding the formulation were as follows:

- 19 (25.7%) formulations were in relation to either liquid or dispersible preparations
- 17 (23.0%) formulations were related to medicines with extended release characteristics eg modified release
- 7 (9.5%) were for various patch formulations.

3.9.5 Essential standard: Duration of long term treatment specified (E5)

One of the essential standard requirements was to indicate if the medication prescribed on discharge is for long term use. It was found that 153 (98.7%) of 155 patients had the duration of treatment specified as long term for at least one medicine on the discharge summary. In the two cases that did not have long term treatment specified, these were justifiable. One case was for a patient with end of life medication predominately and the other patient was only on a course of antibiotics. However, further analysis of the 153 patients who did have long term treatment specified on the discharge summary 122 (79.7%) of these patients' discharge summaries had all the medicines listed as being long term. This means that 31 (20.3%) of these patients did not have one or more of their medicines specified as being for long term use however these may have been prescribed for a course. There were 1,374 medicines specified as being for long term use out of 1,470 or 93.5%.

3.9.6 Essential standard: Monitoring or review requirements specified (E6)

Another essential standard was related to the requirement to indicate if any monitoring or review requirements related to medication are indicated on the discharge summary. Forty-four (28.4%) patients had a monitoring or review statement on the discharge summary related to medication. There were several monitoring or review statements specific for each patient on the discharge summaries reviewed. However, ten patients had monitoring statements related to reviewing the urea and electrolyte results and five of the patients had a statement to monitor the blood pressure after discharge in relation to potential medication adverse effects.

3.10 Essential Standards related to changes in medicines

An essential and important cluster of standards determined from Phase I of the study was related to the documentation on the discharge summary of the medicines that were changed during the inpatient episode of care. That is medication that was stopped, started or a dose was changed during the inpatient episode of care. Figure 12 indicates the potential outcomes on the content of the discharge summary following medication-related actions during the inpatient episode of care (assuming the medication was written on the discharge summary).

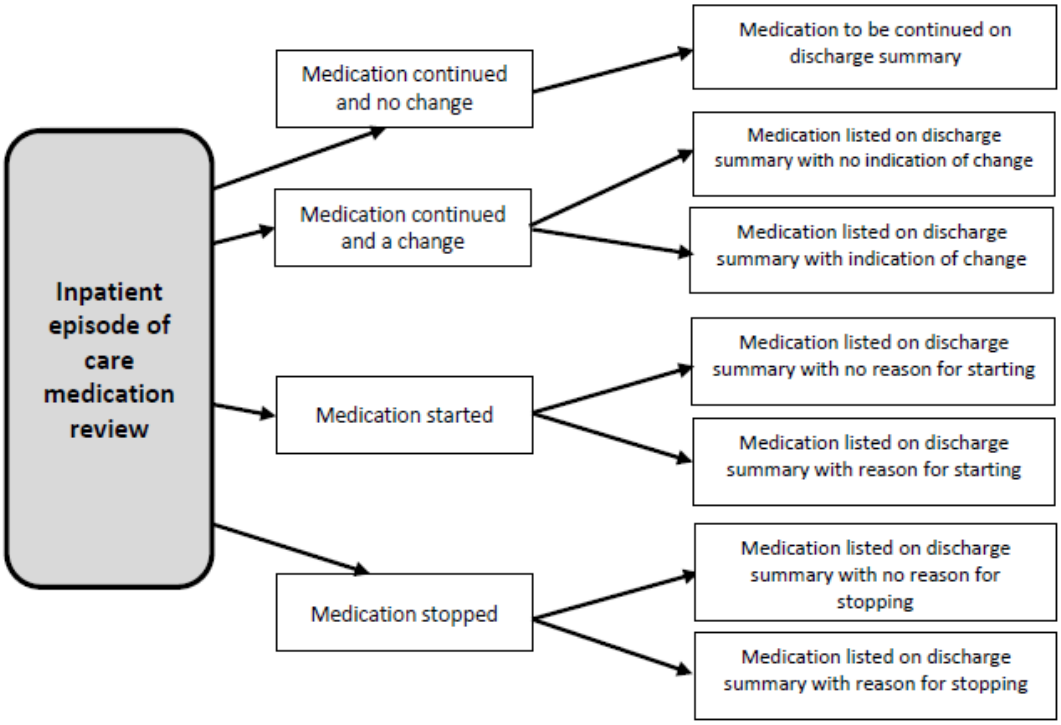

Figure 12: A schematic to illustrate the potential outcomes on the content of discharge summaries of medication-related changes during admission

3.10.1 Essential standard: Medication stopped during the inpatient admission (E7a)

The number of patients with medicines that were stopped was 70 (45.2%) as shown in Table 24. The rest of the patients either did not have any medicines stopped during the inpatient episode of care or was not specified on the discharge summary. An important aspect of this is whether the medication that is stopped during the hospital admission is then updated and documented in the patient's GP medical records. It was found that 60 patients who had medication stopped during the inpatient stay and was indicated on the discharge summary had their GP records subsequently updated. In the case of ten patients (6.4%), they did not have their medicines stopped documented on the GP patient record.

Table 24: Details of patients where medication was stopped

Medication stopped during inpatient episode on discharge summary	Number of patients (n=155) (%)
Yes	70 (45.2)
GP records updated if medication stopped	60 (39.0)
No record of reason for stopping medication	14 (9.0)
Number of patients with no update of stopped medicines on GP records	10 (6.4)
Not indicated	85 (54.8)

3.10.2 Desirable standard: Reason for medication stopped (D5a)

This desirable standard is included in this section as it is related to medication being stopped and keeps all the results together in one section.

Of the 70 of patients who had medication stopped and indicated on the discharge summary during the inpatient admission, this accounted for 130 medicines in total. This represented a mean of 1.86 medicines per patient (SD = 1.16 and standard error of mean 0.138) and a median of 1.5 medicines stopped (IQR 1-2) and with a range from 1 to 7. There were 98 of the 130 medicines with a reason indicated on the discharge summary (75.4%).

The number of patients with medicines stopped against gender is shown in table 25 although gender may not be a risk factor for developing an ADR in the elderly (Tangiisuran et al, 2012). Chi-square test of gender versus medicines stopped confirms a lack of association between gender and medicines stopped in this current study (X^2 0.083 and p=0.978)

Table 25: Number of patients with medicines stopped by gender.

	Male	Female	Total
Number of patients with medicines stopped	29	41	70
Number of patients with no medicines stopped	50	35	85

The mean age of patients with medication stopped was 83.93 years old (SD=7.89) compared with 82.38 years old if no medicines had been stopped (SD=7.95).

Of the 70 patients who had medication stopped during their episode of care, 51 (73%) were over 80 years old. The Charlson Co-morbidity Index (CCI) of the 70 patients who had medication stopped as an inpatient found that 46 (65.7%) of these patients have a score of 6 or above indicating patients who have a risk of 85% mortality within one year. This would indicate that these patients are more likely to be more frail or vulnerable to medication-related harm and ADEs.

Of the 70 patients who had a medication stopped, 14 did not have a reason for stopping the medication specified on the discharge summary or 20% of those who had medication stopped (Table 24). The reasons for stopping medication were variable but well documented. Additionally, of the 70 patients who had medication stopped on the discharge summary 10 patients did not have the GP records updated for 19 medicines (1.3% of all medicines). The 19 medicines that were not updated in the GP records after being stopped out of 130 stopped during the inpatient episode of care is shown in Table 26.

Table 26: Details of medicines not updated in the GP records that were stopped during the inpatient stay

Patient ID (n=10)	Medicine stopped	Comment
A32	ramipril	Low blood pressure
A79	furosemide	No reason
A80	bendroflumethiazide	Low blood pressure
A95	amitriptyline	No reason
A98	methotrexate, losartan, amlodipine, adalimumab	No reason
A103	furosemide, bisoprolol	No reason
A113	amlodipine, ibandronic acid	No reason
A118	atorvastatin, alendronic acid, clopidogrel, lansoprazole	Rationalisation
A125	metformin bumetanide	Poor renal function Low blood pressure
A128	pantoprazole	Not needed

For the 19 medicines out of 130 that were stopped, where the GP records were not updated, (14.6% of medicines stopped) ten out these (53.7%), were for cardiovascular medicines and four (21.0%) were for musculoskeletal medicines. These results suggest that patients with cardiovascular conditions are at more risk of taking medication post-

discharge from hospital when they should not be. This is a cause for concern as this co-morbidity increases the CCI score and may increase the risk of medication-related harm (Hall et al, 2004).

Ten of the 19 (52%) medicines not updated on the GP records did not have a reason for stopping documented on the discharge summary.

For the 14 patients where there was no reason for stopping the medication on the discharge summary, five did not have their GP records altered. One of the patients who had no reason for the medicines stopped on the discharge summary (Furosemide stopped) and no update on the GP's records was readmitted due to medication but little confidence it was associated with the quality of the information on the discharge summary (A79).

3.10.3 Essential standard: Medication started during the inpatient admission (E7b)

In a similar manner to medicines that are stopped during the admission, details of medicines that are started is also considered an essential standard. It was found that 131 (84.5%) of the 155 patients had a medicine started and noted on the discharge summary and accounts for 335 medicines. Most patients had one or two medicines started during the admission and accounts for 78 (50.3%) of the total number of patients in the study.

There was no association between the number of medicines commenced and gender (Chi-square test (X^2) 1.942 and p = 0.163; see Table 27).

Table 27: Number of patients with medicines started, by gender

	Male	Female	Total
Number of patients with medicines started	51	80	131
Number of patients with no medicines started	13	11	24

However, there was a significant relationship between number of medicines started and the number of medicines the patient was discharged on (p=0.000) using the Pearson

correlation (r= 0.347) which is to be expected as the patients in this total study group are already on a median number of nine medicines.

3.10.4 Desirable standard: Reason for medication started (D5b)

This desirable standard is included in this section as it is related to medication being started and keeps all the results together in one section.

120 patients of the 131 patients with a medicine started had a reason stated for starting the medication. This means that 11 patients (or 7.1% of the total population) did not have a reason documented on the discharge summary.

There were 335 medicines started in total and of these 284 (84.8%) had a reason documented on the discharge summary. Figure 13 shows the skewed distribution of number of medicines started and documented on the discharge summary compared with the frequency of this occurring (n=155).

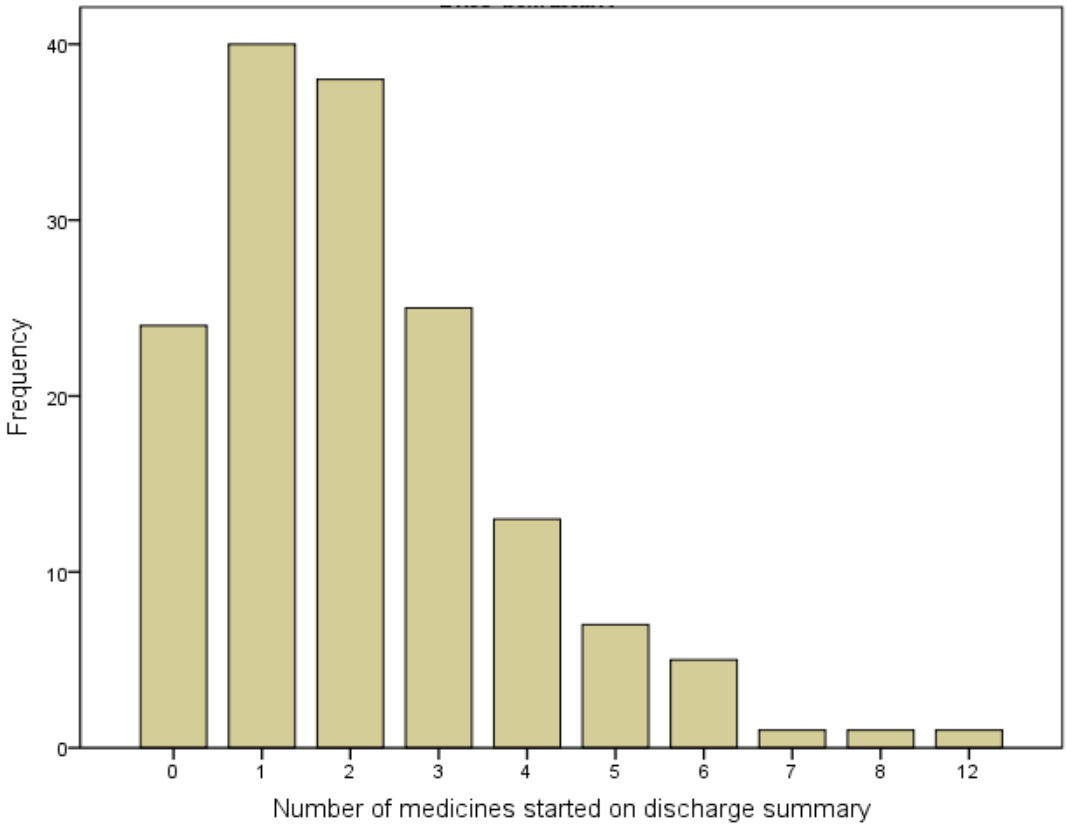

Figure 13: Number of medicines started per discharge against the frequency of occurrence (n=155)

The number of patients who did not have the details about the medicines started during the admission put on the GP records was 23 (14.8 %) excluding patients who were on antibiotic courses. However, of these 23 patients, seven were for simple acute analgesia ie paracetamol; four were for night sedation or agitation ie zopiclone and haloperidol and not expected to be for continuation after discharge, and two were for self-limiting conditions ie cyclizine for vomiting. This leaves 10 patients (6.5% of the total of patients) who did not have a record made in the GP records after the medicine was started during the inpatient episode of care. Details of the medications that were not documented in the GP records after starting is shown in table 28.

Table 28: Details of medication not documented in the GP records that were started during the inpatient admission

Patient ID (n=10)	Medication started	Comment
A33	fresubin, omeprazole	None given
A36	movicol	Constipation
A57	lactulose	Constipation
A68	movicol	Constipation
A85	fresubin, prednisolone	None given
A108	furosemide, bisoprolol, spironolactone	None given
A118	citalopram	Depression
A119	prednisolone, gylcopyrronium inhaler, spironolactone	Steroid course
A122	buprenorphine patch, senna	None given
A150	hydroxocobalamin	None given

In total 17 medicines were not updated on the GP records or 5.1% of the number of medicines started. Seven out of the 17 medicines were for medicines affecting the alimentary tract and metabolism (41.2%) and four medicines were for the cardiovascular system (23.5%).

Ten of the 17 (59%) medicines that were started but not documented on the GP records did not have any reason indicated on the discharge summary. Table 29 gives a summary of the patients with medication started during the inpatient episode of care.

Table 29: Summary of patients with medication started

Patients with medication started during inpatient episode on discharge summary	Number of patients (n=155) (%)
Yes	131 (84.5)
No record of reason for starting medication	11 (7.1)
Patients with no update of medication started on GP records	10 (6.5)
Not indicated	24 (15.5)

3.11 Desirable standards of a discharge summary related to medication

The locally agreed consensus content of a high-quality discharge summary also considered the desirable standards related to medicines and thirteen were identified.

3.11.1 Desirable standard: Documentation of adverse drug events (ADEs) (D1)

A record of an ADE was made for 21 (13.5%) of the 155 patients in the study. Thirty-three ADEs were recorded. Twelve patients had one ADE documented, six patients had two ADEs documented and three patients had three ADEs recorded on the discharge summary. Of the 21 patients who had an ADE recorded on the discharge summary, eight did not have their GP records updated in terms of a description of the ADE or 5.2% of the total number of patients. None of the patients were readmitted due to medication-related issues.

No association was found between ADE and gender using the Chi square test ($X^2 = 0.0256$, $p = 0.875$) in this study although women may suffer more ADEs than men (Rademaker, 2011).

Details of the eight patients and the 12 medicines with an ADE not noted on the GP records are indicated in Table 30. There were therefore 12 out of the 33 ADEs documented on the discharge summary not noted on the GP records or 36.4%. For two of the patients, the ADE was included in the clinical narrative of the discharge summary rather than listed on the ADE section of the discharge summary following the inpatient episode of care. Five of the 12 (42%) medicines with an ADE not documented in the GP records were cardiovascular medicines and again identifies that patients on cardiovascular medicines are at greater risk of low quality medication information on the discharge summary.

Table 30: Indicating the patients with an adverse drug event (ADE) not documented in the GP records

Patient ID (n=8)	Medication with ADE	Details of ADE	Medication stopped noted on discharge summary
A9	sodium valproate	Parkinson's symptoms	Yes
A12	irbesartan	Acute Kidney Injury	Yes
	simvastatin	Acute Kidney Injury	Yes
A51	mirtazapine	Hyponatraemia	Yes
	bendroflumethiazide	Hyponatraemia	Yes
	diltiazem	Bradycardia	Yes
A56	haloperidol	Parkinson's symptoms	Yes
A59	fluoxetine	Ecchymosis	Yes
	clopidogrel	Thrombocytopenia	Yes
A72	amitriptyline	Drowsiness	In narrative only
A148	nitrofurantoin	Skin rash	In narrative only
A149	bendroflumethiazide	Hyponatraemia	Yes

3.11.2 Desirable standard: Details of date and last dose when relevant (D2)

A desirable standard was whether there were details specified on the discharge summary of the date and last dose when a medicine was prescribed where it is important to be aware of these details. For example, a bisphosphonate medicine, administered once a week on a specified day for the prevention of osteoporosis or an opioid patch for pain control applied once or twice a week.

In the study cohort of 155 patients, 34 (21.9%) patients had a medicine where the date and last dose is relevant. The breakdown of the types of preparations where the dates of the last dose were stated, and the frequency is shown in Table 31. In some patients there was more than one medicine where this condition was met. This desirable standard was well documented in this cohort of elderly patients.

Table 31: Types of medicines or situations where date of last dose is needed

Types of medicines or situations where date of last dose is needed	Frequency
Weekly bisphosphonate	15
Two or three times a week opiate patch	8
Monthly administration	2
Twice a week alfacalcidol	2
Weekly vitamin D	3
vitamin B12 injection	4
Other eg reducing dose	2

3.11.3 Desirable standard: Details of no medication prescribed (D3)

In this current study there were no patients who were discharged without any medication and so for this cohort of patients this standard is not applicable.

3.11.4 Desirable standard: Allergy status (D4)

The number of patients who had allergy status documented on the discharge summary was 119 (76.8%). Of these 119 patients where the allergy status was documented 115 (96.6%) had a description of the allergy type on the discharge summary. Forty-nine (31.6%) of the allergy descriptions were documented as 'NKDA' or 'No Known Drug Allergy' (n=155).

Of the 36 patients who had no allergy status written on the discharge summary 24 (66.7%) were written by doctors at either FY Level 1 or 2

3.11.5 Desirable standard: Reason for a change in dose of medication (D6)

There were 31 patients (8 male and 23 female) of 155 (20% of the total number of patients) who had one or more dose changes of their medication indicated on their discharge summary. A breakdown of the number of patients and number of dose changes is illustrated in Table 32. In total there were 45 dose changes for the 31 patients.

Table 32: Number and frequency of dose changes per patient

Number of dose changes per patient	Number of patients (%) (n=155)
1	21 (13.5)
2	6 (3.9)
3	4 (2.6)

Twenty-eight of the patients who had a dose change in one or more medicines documented on their discharge summary had their GP record updated. However, there are three (1.9% of the total number) patients who did not have their GP records updated. Details of the three patients who did not have their GP record updated after a change in dose are indicated in Table 33. None of the patients were readmitted.

Table 33: Details of patients with a dose change during the inpatient admission with no update to the GP record

Patient ID	Medication with dose change	Comment
A16	furosemide	Increase to 40mg twice a day
A66	dexamethasone	For brain tumour
A108	furosemide and bisoprolol	None

For the three patients with no dose change updated in the GP records this affected four medicines. Three (75%) of these medicines were cardiovascular medicines.

Of the 45 medicines with dose changes indicated on the discharge summary, 23 had a reason on the discharge summary (51.1%). Four of the 45 medicines or 8.9% where there was a dose change was not documented in the GP records. However, only 10 had a specific reason for a change. The other comments related to whether the change was an increase or decrease in the dose. Compliance with this standard was therefore 23/45 or 51.1%. If a stricter interpretation is taken there was a compliance of 10/45 or 22.2% with a specific reason documented on the discharge summary of a change in dose. Sixteen patients did not have a reason for the dose change documented on the discharge summary.

Table 34 gives a summary of the patients who had a dose change on the discharge summary.

Table 34: Summary of patients who had a dose change on the discharge summary

Patients with a dose change on the discharge summary	Number (n=155) (%)
Yes	31 (20)
GP records updated	28 (18)
No record of reason on discharge summary	16 (10)
Patients with no update on the GP records	3 (1.9)
Not indicated	124 (80

The number of patients who had a medication started, stopped and changed on the discharge summary was 13 (8.4%) whilst the number of patients with a medication that was started and stopped on the discharge summary was 61 (39.4%).

3.11.6 Desirable standard: Details of adherence problems (D7)

Only five (3.2%) of the 155 patients had details related to adherence indicated on the discharge summary. In all five of the patients, a compliance device was supplied on discharge. Comments that were mentioned on the discharge summary included one patient who was confused and had an accidental overdose, whilst a second comment was related to non-compliance with warfarin medication and a switch to oral rivaroxaban was carried out.

3.11.7 Desirable standard: Details of who to contact on discharge summary (D8)

The requirement to provide details of who to contact on the discharge summary was a desirable standard. For this standard evidence of specific reference of a contact was considered and not just the name of the verification pharmacist or prescriber. Only three discharge summaries (1.9%) of the 155 patients indicated a point of contact if there were any details required about the medication. These were two cases of details of the compliance device supplied (monitored dose system) and one providing details of the community pharmacy that was going to dispense the medication after discharge.

3.11.8 Desirable standard: Medication with reason for use or indication (D9)

Of the 155 patients, 126 (81.3%) had at least one medicine with the indication written on the discharge summary.

A breakdown of the most common indications recorded on the discharge summary was as follows (Table 35).

Table 35: Most common indication on the discharge summary

New medicines	118 (76.1%) of patients had a new medicine with indication out of 155 patients
Antibiotics	23 (14.8%) out of 155 patients
Medicines for constipation	10 (6.5%) out of 155 patients

The total number of medicines with the indication specified was only 287 (19.5%) out of the total of 1,470 medicines on discharge. 273 of the indications were for new medicines

or 95.1% of all medicines with an indication stated on the discharge summary. Table 36 illustrates the frequency of indications stated on the discharge summary compared with the number of medicines and number of discharge summaries.

Table 36: Frequency of indication written on the discharge summary compared with the total number of medicines with indication stated and number of discharge summaries this occurred on.

Frequency of indications stated on the discharge summary	Total number of medicines with indications stated (n=1470) (%)	Number of discharge summaries
1	45 (3.1)	45
2	90 (6.1)	45
3	42 (2.9)	14
4	44 (3.0)	11
5	15 (1.0)	3
6	36 (2.5)	6
7	7 (0.4)	1
8	8 (0.5)	1

3.11.9 Desirable standard: Details of advice given on the discharge summary (D10)

There was only one case or 0.6% of patients where there was any indication given on the discharge summary of verbal advice given to the patient. However, no actual details of advice were specified.

3.11.10 Desirable standard: Details of compliance aids (D11)

Fifty-six (36.2%) of the 155 patients had details of the compliance aid specified on the discharge summary. These were all for compliance devices or monitored dose systems (MDS) and specified the fact that a patient was either using a device or details of the device and the community pharmacy where the medicines were dispensed from. The abbreviation 'MDS' was used in all cases and was never defined to the GP.

3.11.11 Desirable standard: Details of other relevant contacts (D12)

This desirable standard relates to whether there was any mention of other contacts who may be involved with the medication aspects of the discharge. For 55 of patients (35.5%) details were included of other relevant contacts. In all cases these were related to the place of dispensing of a compliance aid or monitored dose system (MDS). The abbreviation MDS was used on 31 occasions or 56.3% of the total where a relevant contact was mentioned.

3.11.12 Desirable standard: Details of written information (D13)

Details of written information related to medication were only specified for four patients or 2.6% of 155 patients. Two of these were related to the provision of a medication card that was issued to the patients. One patient's discharge summary stated details of a relative that administers insulin to the patient and the other remaining discharge summary gave details about the introduction of allopurinol for the treatment of gout after the acute episode of gout was over.

3.12 Overall adherence scores

3.12.1 Overall adherence scores for the essential/gold standards

Using the method adapted from that described by Aziz et al, (2016), the overall adherence score of the discharge summaries for the essential standards is 64.63 %. Table 37 provides the overall adherence characteristics for the essential or 'gold standards'.

Table 37: Overall results for level of adherence to the essential standards

Parameter	Result (%)
Mean	64.63
SD	9.25
Range	48.49
Minimum	33.31
Maximum	81.82

There are 14 patients who have an adherence score of ≥ 80% (9% of patients) and 15 patients with an adherence score of ≤ 50%.

3.12.2 Overall adherence scores for the additional essential standards

Overall adherence scores were also calculated for the standards of the study that were not identified as being essential but were considered in the studies by Aziz et al, (2016) and Hammad et al, (2014) and shown in Table 38 and based on the number of medicines involved. These essential standards related to medicines that were changed, started or stopped during the hospital admission and a reason was documented on the discharge summary

Table 38: Overall adherence scores for the therapy change standards by the number of medicines

Group	n/N	%
Medication changed with a reason on discharge summary	23/45	51.1
Medication stopped with a reason on the discharge summary	98/130	75.4
Medication started with a reason on the discharge summary	284/335	84.8

If the scores are included for the therapy changes then the overall adherence score is 67.05 %.

3.13 Influence of variables on adherence to the gold standards

A number of variables were selected to test the association that the quality of discharge adherence score was not associated with hospital readmission within 30 days of discharge. The following variables were chosen because:

(a) Gender and age range - some evidence suggests that women suffer more ADRs than men and therefore a patient with MRH may be associated with gender and the quality of the discharge summary (Rademaker, 2001) whilst increasing age may affect ADRs due to physiological changes (Tangiisuran et al, 2010).

(b) The number of medicines and certain conditions or co-morbidities have been found to be associated with an ADR in patients 65 years or older (Onder et al, 2010) as well as length of stay and therapeutic class of medicine (Tangiisuran et al, 2012) and therefore included as variables in this study.

(c) The level of experience of the doctor writing the discharge summary may be important as they may be unaware of the discharge requirements of a GP (Yemm

et al, 2014) and may have a major input into the level of quality of the discharge summary.

(d) The process of medicines reconciliation and related verification of a discharge summary may have the ability to influence the accuracy and quality of a discharge summary and are included as variables (Sentinel Event Alert, 2006).

(e) Readmission has been found in up to 23% cases to be due to ADRs (Davies et al, 2010) and therefore may be related to the quality of the discharge summary. The use of a compliance aid was included as a variable as it may be a proxy for patients who require additional assistance with their medication and so may be more susceptible to the consequences of poor communication about their medication post-discharge.

3.13.1 Influence of gender

The variable of gender was considered to see if there is any association with the 'gold standard' adherence score. From univariate tests the mean percentage adherence was calculated and is shown in Table 39.

Table 39: Gender and mean adherence score in relation to the gold standards

Gender	Mean adherence (%)	SD	n
Female	64.96	8.17	91
Male	64.15	10.65	64
	64.63	9.25	155

There was no association between gender and the quality of the discharge summary in relation to the essential/gold standards using the independent samples t-test (t=0.530 and p=0.597).

3.13.2 Influence of age range

The patients in the study were all over 65 years of age but it was of interest to establish if the age range of the patients influenced the adherence score for the 'gold standards'. From univariate analysis using the mean scores of the percentage adherence with the gold standards in relation to age range was calculated (Table 40). Using the Mann Whitney test no association was found between the youngest age group (61-71 years old) and the oldest group (≥92 years of age), (U= 210.5 and p= 0.191).

Table 40: Age range and mean adherence score in relation to the gold standards

Age range (years)	n	Mean adherence (%)	SD
61-71	19	62.35	7.20
72-81	42	64.67	9.26
82-91	69	64.84	10.36
Over 92	25	65.67	7.35
All	155	64.63	9.25

3.13.3 Influence of number of medicines

A variable that may influence the adherence to the 'gold standard' was that of the number of medicines on the discharge summary. From univariate analysis it was found that there was little variation in the mean adherence score against the number of medicines (Table 41).

Table 41: Number of medicines on the discharge summary and mean adherence score in relation to the gold standards

Number of medicines on discharge summary	Mean adherence (%)	SD	n
1-5	66.46	2.07	21
6-9	64.78	1.44	59
10-15	63.08	1.19	65
>15	64.47	3.31	10
Overall	64.63	1.20	155

There was no association between the number of medicines on the discharge summary and the adherence score for the quality of the discharge summary in relation to the essential/gold standards using the Kruskai Wallis test (value = 17.177. p = 0.641).

3.13.4 Influence of therapeutic classes

The main therapeutic classes found in the study were anti-thrombotic agents, anti-dementia agents, diuretics, diabetes agents and agents used for Parkinson's disease. These are all potentially agents that can cause medication-related harm in the elderly.

The mean overall level of adherence with the 'gold standards' was calculated using univariate statistics and compared with the therapeutic class of a high-risk medicine (Table 42). There was no association between highest performing therapeutic agents, anti-dementia agents, and adherence score using the Mann Whitney test (U= 685 and p= 0.452) or for the lowest performing agents, anti-thrombotic agents (U= 2610.5, p = 0.291).

Table 42: Overall mean adherence score with gold standards compared with certain therapeutic classes of medicines

Therapeutic class	Mean adherence (%)	SD	Number of patients (n)
Anti-thrombotic	63.99	9.71	92
Anti-dementia	66.96	8.78	11
Diuretics	64.61	9.11	50
Diabetes	65.90	8.57	24
Parkinson's disease	65.82	10.17	20
All medicines (overall)	64.63	9.25	155

3.13.5 Influence of type of prescriber

The type of prescriber who produced the discharge summary was considered. From univariate analysis the mean adherence scores for the 'gold standards' were calculated in relation to prescriber type (Table 43). In comparing the most senior prescribers ie consultants with the most junior prescribers ie FY1, there is no association with the adherence score using the Mann Whitney test (U= 180, p= 0.632).

Table 43: Prescriber types and mean adherence score in relation to the gold standards

Prescriber type	Prescriber code(s)	Mean % adherence	SD	n
Nurse	0	70.00	0.00	1
Foundation Year 1	1	64.09	9.60	68
Foundation Year 2	2	66.15	8.70	43
Speciality Training (ST) 1	3	70.60	17.87	3
ST2	4	57.57	9.36	5
ST3	5	70.00	14.14	2
Consultant	6	61.85	13.16	6
Non-Career Grade Doctor (NCGD)	7	64.18	6.67	27
Overall compliance	All	64.63	9.25	155

3.13.6 Influence of pharmacist verification

The influence of the intervention of a pharmacist verification of the discharge summary was also considered. From univariate analysis the mean scores of the percentage adherence against pharmacist verification was calculated (Table 44). However, this is insufficiently powered, as the number of discharge summaries without a pharmacist verification was too low.

Table 44: Pharmacist verification and mean adherence score in relation to the gold standards

Pharmacist validation	n	Mean adherence (%)	SD
No	7	60.00	13.88
Yes	148	64.84	8.99

3.13.7 Influence of pharmacy-led medicines reconciliation

The mean scores of the percentage adherence with the gold standards in relation to pharmacy-led medicines reconciliation (PMR) was calculated to establish if a PMR contributed to the adherence score (Table 45). The Mann Whitney test found no association between PMR and the quality of the discharge summary adherence score ($U= 991.5$, $p= 0.721$).

Table 45: PMR and mean adherence score in relation to the gold standards

PMR	n	Mean adherence (%)	SD
Yes	140	64.56	9.25
No	15	62.20	9.57
Overall	155	64.63	9.23

3.13.8 Influence of patients readmitted

Phase III of the study considers the likelihood of the level of the quality of the discharge summary contributing to a patient's readmission. Using univariate analysis, the mean scores of the adherence with the 'gold standards' in relation to patients readmitted (for any reason) was calculated (Table 46). No association was found between patients readmitted and the adherence score for the quality of the discharge summary using the Mann Whitney test, (U= 1636 and p= 0.197).

Table 46: Patients readmitted and mean adherence score in relation to the gold standards

Patient readmitted	n	Mean adherence (%)	SD
Yes	31	66.66	9.33
No	124	64.17	9.20

3.13.9 Influence of length of stay

The length of stay is a variable that may influence the adherence score to the 'gold standards' so from univariate tests the mean scores of the percentage adherence with the 'gold standards' in relation to patient's length of stay was calculated (Table 47). Using the ANOVA test statistic (F=0.84, df= 3) found a p value of 0.475 so there was no relationship with the quality of the discharge summary and length of stay.

Table 47: Length of stay and mean adherence score in relation to the gold standards

Length of stay (days)	n	Mean adherence (%)	SD
1- 7	71	65.29	10.13
8-14	33	62.57	9.68
15-28	39	65.50	7.95
29-84	12	63.50	5.90

3.13.10 Influence of compliance aid

Of the 56 patients with a compliance aid the overall adherence score with the gold standards was 65.36% (SD 7.60) compared with 64.63% for overall adherence. From the Mann Whitney test no association was found between patients who used a compliance aid and adherence score, (U= 2596.5 and p= 0.510). This group was chosen because patients who require a compliance aid may be considered at higher risk of a medication error as they may require additional support in order that they take their medication as prescribed.

3.14 Discussion

The main finding of Phase II of the pilot study was that the overall adherence to the 'gold standards' (E1 to E7 essential standards) was 64.63%, reflecting the quality of discharge information in relation to medication using the essential standards identified by consensus in Phase I. This is important and provides preliminary evidence of the use of a modified e-Delphi technique based on published recommendations and local expert opinion to identify the essential components of a discharge summary and measure how well this is being adhered too.

The results provide evidence of the level of adherence to the individual standards and demonstrates a marked variation in meeting the standards ie duration if a course (E2) is 100% whilst formulation being specified (E4b) is 5%. The following discussion will consider the results and implications for clinical practice, policy and future research. In addition, a comparison will be made with other published studies to identify where there is a common issue or new issue that needs to be considered.

This is the first study where the relationship between the classification of the therapeutic classes used in the discharge summary have been considered that could determine the risk of readmission due to the low quality of discharge information. Whilst no relationship was found in this study, there are indications that some therapeutic classes may pose greater risk than others and due diligence should be exercised when completing the discharge summary for these classes eg cardiovascular medicines. Some of these themes will be explored more fully in Chapter 5 and this preliminary pilot study provides a template for larger studies to be carried out.

The essential standards, E1 to E3 and E5, could be considered as essential and core standards. That is, they provide the basic information to the GP of the medication information on the discharge summary ie route, duration (if a course or long term), generic name, dose and frequency. These standards all had an adherence score of > 90%. In comparison the essential standards for strength being specified and formulation were very low at 6% and 5% respectively. One of the reasons for this could be that the design of the discharge summary template at the study hospital forced the prescriber to complete standards E1 to E3 and E5 whereas there was no requirement to specify the strength and formulation on the discharge summary. The implications for this are discussed in Chapter 5. However, the consequence for clinical practice is the excellent adherence to the core essential standards will improve communication to the patients GP and reduces the risk of a medication error.

The essential standard requiring the strength and formulation to be specified (E4a and E4b) scored poorly with only 6% and 5% adherence respectively. Although these standards were considered essential it is not needed for all medicines. Shah et al, (2016) reported adherence of 60.3% for formulation but did not give a reason for this. It may have been related to the design of the discharge template used in each hospital studied. For many oral medicines the dose and strength is implicit so that the GP does not need to know the strength of the preparation eg paracetamol tablets. It will only be of importance if there is an ambiguity of the dose or there is more than one strength of a preparation that could be prescribed. This may explain why only certain types of medicines had the strength specified eg eyedrops, inhalers where more than one strength exists. Also, the poor score for formulation again may be due to it being implicit with the dose instructions eg modified release preparations. The implications for clinical practice are that the prescriber and verification pharmacist need to ensure that the discharge summary is clearly and accurately annotated with the strength and formulation details if it is clinically relevant to do so. Doctors will often not be familiar with the strengths and formulations available and this is likely to be a task for the pharmacist.

The adherence score for essential standard of details of monitoring or review required (E6) was only 28.4%. This may be a result of the prescriber's either not concerned clinically that the GP needs to undertake any specific monitoring post-discharge or not being aware of the importance of this standard for the GP. Junior doctors are often not aware of the discharge information requirements of a GP (Yemm et al, 2014). This cohort

of patients are all elderly often with multi co-morbidities and polypharmacy and this should be an area of priority when designing a training package for junior doctors on producing a 'gold standard' discharge summary. The expert panel in Phase III identified this as an important standard to reduce the likelihood of a readmission as it provided advice to the GP on what needs to be followed up post-discharge. In a recent study in Ireland a GP survey of what they considered to be important also included information on follow-up and supports the increased emphasis on completing this aspect of the discharge summary (Murphy et al*,* 2017).

A cluster of essential and desirable standards of interest are those related to where there has been a change in the medication ie stopped (E7a), started (E7b) and a reason specified on the discharge summary for it being stopped (D5a), started (D5b) or changed (D6). In this current study these standards were inconsistently applied. Details of medicines stopped was only provided in 45.2% and started in 84.5% of cases. It was not always clear in the discharge summary whether the medication had been stopped or started if it was not clearly documented on the Evolve® discharge summary. This may contribute to a medication discrepancy post-discharge. In this current study 14.6% of medicines stopped and 5.1% of medicines started were not reconciled on the GP records post-discharge. Shah et al, (2016) found that for medicines that were stopped/started or had a dose change 12.5% were not actioned within seven days of the receipt of the discharge summary. There was a trend for cardiovascular medicines to be omitted on the GP records for medicines started and stopped in this current study. This was also evident in patients with a high CCI score and therefore is a concern that patients who are at most risk have low-quality information on their discharge summaries and poor discharge medicines reconciliation. Costa and Byon, (2018) found that for every medication discrepancy post-discharge, the odds of being readmitted within 90 days increases by 32%. A clinical implication is that elderly patients with a high CCI score need to be prioritised to have a gold standard discharge summary produced, as they may be more liable to medication-related harm post discharge. It is increasingly being recognised that de-prescribing of medicines is important to optimise safe prescribing (Barnett and Jubraj, 2017). Hence, if a medication is intentionally stopped it is important that the GP is informed about this and acts upon the recommendation. A larger study, if undertaken, with more patients could test the level of DMR in primary care.

In the study hospital site, the inpatient drug administration record has a section for each medicine to annotate the status on the chart according to the 'ENID' classification. This means that doctors and pharmacy staff can indicate on the record if the medication is: Existing, New, Increased or Decreased at any stage of the inpatient episode of care. When the electronic discharge summary is completed the prescriber and/or the verifying pharmacist can indicate the status of therapy for each medication directly from the inpatient prescription. This process may contribute to the higher number of medicines started that have a reason specified on the discharge summary (D5b), in this current study of 84.8%, because the status can be taken from the record on the chart at the point of producing the discharge summary. This study has better results compared with the studies by Uitvlugt et al, (2017) of 72%; Aziz et al, (2016) of 51.5%; Hammad et al, (2014) of 34.8%; and Shah et al, (2016) of 49%. There are also similar results for reasons for a medicine stopped (D5a) of 75.4% in this current study compared with 20% in the study by Hammad et al, (2014) and 57% by Shah et al, (2016).

In this study ADE documentation was considered a desirable standard (D1). Only 21 patients (13.5%) had an ADE documented on the discharge summary. A limitation of this study was that the patient's full medical records were not analysed to establish if an ADE occurred during the inpatient stay but was not documented. The finding that eight patients out of 21 did not have an ADE documented on the GP records representing 12 medicines with an ADE is a concern. Whilst the number of ADEs is small (1.4% of the total) the high ratio of ADEs not documented in the GP record (36.4%) increases the potential for future medication-related harm to the patient. There would be no record of the ADE in the primary care records. This standard would be an interesting area of future study to understand why the GP records were not updated and to assess the level of risk of ADEs occurring if not documented in the GP records. There was a small tendency for cardiovascular medicines causing an ADE (five or 42% of the total omitted) to be omitted from the GP records and this reinforces the need to prioritise patients on cardiovascular medicines to obtain a high-quality gold standard discharge summary.

The allergy section was only completed for 76.8% of patients (desirable standard, D4). This is consistent with the results of Shah et al, (2016) who reported allergy status documented in 75.8% of cases and may reflect why it is a desirable standard. This is a further example of the design of the discharge summary template influencing the performance. In the study hospital the allergy section is separate to the medication

section and is not mandatory to complete so it can be easily ignored by the prescriber who may not have time to compete the discharge summary fully. There is therefore potential to improve this standard either through electronic template re-design or empowering other healthcare staff eg nurses, pharmacy staff to ensure this section is completed prior to final discharge of the patient.

There was little evidence of any value being placed on either verbal advice being provided (D10, 0.6%) or written information provided (D13, 2.6%) and this agrees with that found in a systematic review by Wimsett et al, (2014). In this review little value had been put on the importance to provide advice to patients, verbally or written about medication at discharge and this is a neglected area of patient care that requires further study and emphasis in clinical settings.

This does not mean it did not occur but was not documented. Interestingly, at the study hospital, patients can be given a bespoke 'medication card' which lists all the medicines the patient is taking, when to take them and any side-effects to be aware of. There was no evidence of the study patients receiving these cards and it may be worth exploring their use again as there is value in using them (Costa and Byon, 2018). Often elderly patients are on complex medication regimens and there is evidence that the more complex the medication regimen is it
may lead to medication discrepancies at home so that any intervention to support patient understanding of the medication regimen should be encouraged (Costa and Byon, 2018).

A secondary objective of the study was to consider the level of PMR and pharmacist verification prior to discharge. In both cases there was a high score with 90.3% of patients receiving a PMR prior to discharge and 95.5% of patients having a pharmacist verification of the discharge summary prior to discharge. This compares well with the audit carried out by Shah et al, (2016) which found only 49% of discharge summaries had been verified by a pharmacist and this may reflect difference in policy between hospitals and the sample of patients in each study. Whilst both results are encouraging there is still some caution with this data. There is evidence that despite a PMR being undertaken during admission, not all unintentional discrepancies identified are been acted upon prior to discharge. Cornu et al, (2012), found that the acceptance rate for pharmacist's interventions was only 72.3% and only corrected in 55.6% of cases. Also, pharmacists are not available 24 hours a day and will not be able to screen all discharges (Cornish et al,

2005). It is therefore a limitation of the study that there was no reconciliation undertaken between the medication that the patient was admitted on and that on discharge. If a further study was undertaken it would be useful to do this to strengthen the study methodology. Furthermore, a larger study may be able to determine if the absence of pharmacist verification of the discharge summary affects the quality of the discharge summary particularly patients who are discharged out of hours or at weekends when pharmacists may not be available. It may be necessary for pharmacy managers to consider a delay in sending the final discharge summary to the GP to ensure that a pharmacist verification has taken place to improve the accuracy of the discharge summary as recommended by Yemm et al, (2014) although this was not identified in this current study due to the lack of power to detect an effect.

A further secondary objective was to determine if any patient, medication or service variable influenced the level of adherence to the essential standards.

In this current study whilst many variables were considered and analysed there was a lack of association of the total adherence score for the gold standards and gender, number of medicines, therapeutic classes, type of prescriber, influence of pharmacist verification, influence of PMR, age range, length of stay and requirement for a compliance aid. The reasons for the lack of association are likely to be multi-factorial. For some of the essential standards identified the performance was determined predominantly by the inherent design specification of the electronic discharge summary template. For some variables the level of performance was high such as PMR (90.3%) and pharmacist verification prior to discharge (95.5%) and so any effect of the absence of the intervention would be difficult to detect with the small sample size. It is recommended that this preliminary pilot study should be undertaken with more patients and in more settings to increase the power, reliability, validity and generalisability.

Although undertaken in a different healthcare setting (Norway) an audit evaluated the quality of medication information in discharge summaries and variables associated with the level of quality (Garcia et al, 2017). The method used to calculate adherence was different to that used in this current study and was based on that described by Hammad et al, (2014). Garcia et al, (2017) reported lowest adherence scores for generic name and indications for medicines use whilst in this current study generic names (E3a), had a high score (93.2%) and indications (D9) a low score of 19.5%. These differences may be due to

the different processes to prepare a discharge summary between Norway and the UK where the discharge prescription is written by hand in Norway. Males had a higher score than females in the Norwegian study, but, this was not found in this current study. It was postulated that this may be due to differences in the information supplied on admission between genders. In this current study the mean age of patients was older (83 years) compared with 65 years in the Norway study and may also be a confounding factor. These findings support the need for further research of the effects of these variables in larger studies.

A recent study in the USA has suggested that the complexity of the medication regimen may be an important factor resulting in medication discrepancies at home and a further study could look at measures of medication complexity as a variable on the quality of the discharge summary (Costa and Byon, 2018).

Interestingly the level of adherence to the discharge summary was not influenced by the number of medicines the patient was discharged on or the length of stay in this current study. It may be expected that the higher number of medicines a patient is on the lower the adherence score. This reason for the lack of association may be because patients were under the care of an elderly care medical team that knew the patient and could complete a high-quality discharge summary and the high level of pharmacist verification prior to discharge. However, only 14 (9%) of patients had an adherence score of ≥80% in the current study and so there is room for improvement. It is worth noting that the scores for the strength and formulation essential standards were very low and reduced the overall adherence scores but demonstrated that further work is needed to improve the gold standard adherence levels.

Despite the lack of clear variables that influence the quality of a discharge summary for medication-related information, the method and approach used can be developed for further, larger research studies.

3.14.1 Comparison with other studies

Several studies have considered the adherence to a standard for discharge summaries related to medicines and are worth considering as they are either based in England or Ireland and reflect current practice in the UK ie Aziz et al*,* (2016); Hammad et al*,* (2014); and Shah et al*,* (2016) and a comparison with this study is shown Table 48.

Table 48: Comparison of results with other published studies

	Current Study	Aziz et al (2016)	Hammad et al (2014)	Shah et al (2016)
Demographic details				
Number of discharge summaries	155	198	3,444	1,454
Median age of patients	85	63	66	72
% male patients	41.3	50.3	49.1	47.0
Median number of medicines	9	NR	5	NR
Adherence results (%)				
Duration stated (E2)	100*	87.8	35.9	72.5
Generic name specified (E3a)	93.2	97.8	NR	97.9
Dose stated ((E3b)	99.5	98.3	87.5	92.2
Frequency stated (E3c)	99.7	98.6	89.6	98.8
Reason for medication stopped specified (D5a)	75.4	NR	20.0	57.0
Reason for medication started specified (D5b)	84.8	51.5	34.8	49.0
Reason for change specified (D6)	51.1	63.7	20.5	39.0

Key:

NR = Not Reported

***** = Duration specified if for a course

There is generally good adherence to the core essential standards with results consistently at or above 90% for generic name, dose and frequency (E3a to E3c). This would suggest that these standards are embedded into the discharge processes. There is considerable variation in adherence to the duration standard (E2). In this study standard E2 relates to duration if it is a course. In the studies by Aziz et al, (2016) and Hammad et al, (2014) no definition of what this standard means was provided whereas Shah et al, (2016) define this standard as instructions for ongoing use/supply stated, which is more useful. A difference in results might be expected if there is differentiation between a specific course of treatment versus long term treatment. This is important for clinical practice as the GP needs clarity on the anticipated duration of treatment (Aziz et al, 2016).

What is apparent for all studies is the poor adherence to the standards relating to documenting reasons for medication changes varying from 20.5% in the study by Hammad et al, (2014) to 63.7% in the study by Aziz et al, (2016) and 51.1% in this current study. There are also discrepancies in the adherence for reasons for medicines stopped and started indicated on the discharge summary. It has been suggested that the low

adherence for these may be due to being missed due to human error (Hammad et al, 2014). Whilst this is a possibility, it suggests that there is a lack of awareness of the importance of this type of information by hospital staff for the GP.

The results of this study and the other published studies provides evidence that there is still an urgent need to improve the quality of discharge information relating to medication changes to reduce the potential for any medication-related harm post-discharge.

The overall adherence score for the essential standards in this study was 64.63%. If the standards for therapy changes were included, then, the adherence score would be 67.05% which is still below the ideal level eg >80%. In the study by Aziz et al, (2016) the overall adherence score to the standards was of a similar order, 77%. The method recommended in the study by Aziz et al, (2016) was used and adapted in this study and supports the use of this method for further larger studies.

A further study was recently carried out in a 550-bed teaching hospital in Holland investigating the level of adherence to the Dutch healthcare guidelines for medication-related information in discharge letters (Uitvlugt et al, 2017). Two hundred and eighty-eight patients were included in the study with a mean age of 62 years and 46% were male. In total 1,432 (53%) of 2,696 medications were documented incorrectly in the discharge summary. In 453 (16.8%) cases there was absence of either the drug name or dose. There was no differentiation between the drug name or the dose of the medication. This contrasts with the results in this current study and others. In this current study the generic name was documented in 93.2% of medicines and demonstrates the difference where there are different processes, health systems and electronic systems. Also, 28% of new medicines were started without a reason mentioned on the discharge summary compared with 15.2% in this current study.

There has been recognition that the content of discharge summaries is a critical source of information in the transition of care from hospital to primary care services (Van Walraven and Rokosh, 1999). Clearly, one of the most important components of the discharge summary is that related to medication and has been cited as often being missing (Belleli et al, 2013). This has prompted several audits to assess the level of performance in relation to medication-related incidents in the discharge summary. McMillan et al, (2006) found that there were 1.42 errors per discharge summary for medical patients discharged

from hospital. Tan et al, (2014) carried out an audit of discharge summaries of medication changes and follow-up expectations with a method like this current study so a useful comparison can be made. The study was based in a 607-bedded teaching hospital in Australia. Patients were eligible if they were discharged directly from an acute assessment unit. Basic demographic data, hospital length of stay and admission and discharge medications were recorded. The specific criteria of the audit were in relation to information on medication changes and of follow-up. A comparison between the study by Tan et al, (2014) and this current study is shown in Table 49.

Table 49: Comparison of the audit results by Tan et al, (2014) and this study

Dataset	Tan et al, (2014)	Current study
Number of patients	219	155
Mean Age (years)	73	83
Mean number of medicines	7.8	9.48
Common classes of medicines (%):		
Alimentary tract	24.2	23.0
Nervous system	23.2	22.0
Cardiovascular system	11.3	21.0
Anti-infectives	28.0	4.0
MR (%)	93	90
Indications (%)	50.0	19.5

The study by Tan et al, (2014) gave remarkably similar results to this current study despite being based in a different country with a different healthcare system and ward setting (acute assessment unit versus care of the elderly wards). In the Australian study only 50% of the patients with a medication change had documentation relating to indications for these changes and follow-up expectations. It was felt that the reason for the low percentage was that discharge summaries were often completed by junior medical staff who may not have been directly involved in the patients' care. In Norway, Garcia et al, (2017) also found that there was a low adherence score for indications stated.

In this current study the level of adherence with indications of 19.5% compared with 50% in the Tan et al, (2014) and, 11% in the Shah et al, (2016) studies. It is difficult to explain, as it would be expected that the junior doctors being elderly care ward-based have greater knowledge about the patient when they prepare the discharge summary and improve the quality of medication-related information. It could be that there was greater

emphasis working in an acute assessment unit on medicines compared with working in a care of the elderly ward. This may be of relevance in clinical practice in that the type of ward in which the discharge summary is prepared may have an influence on the quality of medication-related information on the discharge summary.

It has also been found that elderly patients may not understand intended medication changes or new medicines post-discharge (Ziaelan et al, 2012).

So, future research could look at the effect of both the differences between ward specialities and adherence to the gold standards and the effect of interventions to improve patients understanding of their medication at discharge that could reduce post-discharge medication errors.

The successful application of the modified e-Delphi technique to develop gold standards for a discharge summary has been demonstrated in this preliminary pilot study and could be further developed for a larger multi-site study. The method of calculating the total adherence scores could also be used in a larger study to validate the method. Whilst no association was found between the gold standard adherence score and a variety of variables, this would be worth exploring in a larger, multi-site study.

Whilst the small study sample size and the use of only one site/speciality for the data collection with a single electronic discharge process limits the generalisability of the result, this preliminary pilot study does provide a template for further research.

3.15 Limitations of Phase II of the study

The study was conducted in a single site district general hospital in a rural area of England which limits the generalisability of the results to other types of hospitals which may operate in a different manner. Whilst the cohort of patients selected were elderly the study population may not be representative of the population of elderly patients in England. Also, whilst the wards selected to recruit patients were identified as care of the elderly wards, they may not reflect a typical population of elderly patients within the entire hospital. For example, Hammad et al, (2014) found low adherence scores on orthopaedic wards.

The data collection period for the audit of adherence with the discharge standards was only over a six-month period and was carried out between January to June 2016 and may not be representative of all types of discharge over a longer consecutive period as well as practice changing since 2016.

The sample size was small of 155 patients and therefore is a pilot for a larger sample size and study. No attempt was made to record the reconciliation of the pre-admission medicines with the medicines at discharge. This means that medicines omitted due to intentional and unintentional reasons may not have been recorded on the discharge summary. However, most of the discharge summaries were subject to a PMR and pharmacist verification of the discharge summary prior to discharge to minimise any transcription errors at discharge. These two interventions would reduce any unintentional discrepancies between the pre-admission medicines and the discharge medication. However, there is evidence that not all pharmacist interventions after MR are acted upon prior to discharge (Cadman et al, 2017).

This current study only considered patients who were admitted as an emergency and it may be there are differences between emergency and elective admissions that influences the quality of the discharge summary that warrants a further study. Hammad et al, (2014) found slightly higher adherence for discharge information for emergency admissions for medication changes compared with elective admissions. This was not possible to consider in this study due to time constraints, but, the method could be used for other types of admissions. It is worth noting that the quality of outpatient medication information is also poorly studied and may be another interesting area to consider for a future study.

Chapter 4: Relationship between the quality of discharge information related to medication and readmission to hospital of elderly patients (Phase III)

4.1 Overview

In chapter three, Phase II of the study provided a result for the overall adherence to the 'gold standards' of a discharge summary of 64.63%. Whilst there was a lack of association with the variables the method employed provides a basis for a larger, multi-site study.

Phase III of the study was to evaluate whether the quality of medication-related information (MRI) in the discharge summary had any impact on the likelihood of a readmission to hospital due to medication within at least 30 days of discharge of elderly patients. The hypothesis being that a poor-quality discharge summary related to medication information may cause or contribute to a hospital readmission.

Various studies have been undertaken to assess the extent of either the severity or likelihood of a medication error occurring (Hartwig et al*,* 1991; Sakowski et al*,* 2008; and Dean and Barber, 1999). For example, there has been considerable interest in the ability to predict or quantify the severity of medication-related harm (MRH) due to medication errors or adverse drug reactions (ADR). In this study the application of methodology used in the assessment of likelihood of medication-related harm occurring will be used so it is important to consider the basis of the research method utilising published studies related to MRH and/or ADRs.

The basis of the assessment or measurement of severity of the medication error can vary depending on the study type and measuring patient outcomes (Hartwig et al*,* 1991) or processes (Sakowski et al*,* 2008). Any method that is employed must be valid, reliable and practical to measure. A method that adopts a patient outcome approach is likely to have high validity ie be a real measure of the severity but may have practical limitations especially if the data is undertaken through observations (Dean and Barber, 1999).

If an observation-based study is employed, then it can be split into two types. The first type is when an observer is aware of the error as it occurs such as during drug administration. This type of observation may cause ethical concerns as an error may occur

or be about to occur which requires the observer to make an intervention. So, in this type of study the actual patient outcome may not be known (Ridge et al, 1995). The other type of observational study involves a retrospective analysis. This may make it difficult to identify any clinical effect due to a delay in recognising cause and effect (Dean and Barber, 1999). An alternative option therefore is to consider assessing the severity based on a potential patient outcome and will not be susceptible to subjective measures.

An important study that provided a basis for this current study was carried out by Dean and Barber in 1999. This study described a reliable and validated method to score the severity of medication errors based on potential patient outcomes. They adopted the so-called generalisability theory to assess how the number of judges, the judge's professional groups and the number of scoring occasions affected the severity scores. Generalisability theory allows the estimation of the size of measurement error from multiple sources (Shavelson et al*,* 1989; Cor and Peeters, 2015). So, if there is an assessment of the severity of a medication error the main sources of variation included will be due to differences in the judges or expert panel members, when the error occurred and so on. If these variances are quantified, then a method to reduce unwanted sources of variance can be found.

Dean and Barber (1999) asked thirty healthcare professionals or judges to score 50 medication errors in terms of potential patient outcomes on a visual analogue scale from 0 to 10. The errors were minor, moderate or severe in nature. They found that a reliable, validated method of scoring the severity of a medication error that did not require knowledge of patient outcomes requires at least four judges. Also, the reliability and validity were not affected by the professions or the number of times on which the error occurred.

The principles of the study by Dean and Barber (1999) were then applied in this study to develop a method to rate the causality and severity of a patient being readmitted to hospital due to medication. The causality being related to the poor quality of medication-related information on the discharge summary. An expert panel was used to undertake this assessment.

Medication errors or MRH may result in admission to hospital particularly in elderly patients (Tangiisuran et al*,* 2010). The consequences can lead to increased morbidity, mortality and increased health care costs (Pirmohamed et al*,* 2004). It is therefore desirable to be able to target clinical interventions to reduce the likelihood of an adverse event. This has led to the concept of risk reduction models being used in healthcare to predict ADEs in elderly patients due to their increased risks. A recent systematic review of predictive risk models for ADEs in hospital for inpatients found that two studies had demonstrated good validation, model development and reasonable performance and could be developed for future clinical application (Falconer et al, 2018**).** These two predictive risk reductions models were by Trivalle et al*,* (2011) and Tangiisuran et al, (2014).

In the Trivalle et al*,* (2011) model the focus was only on medication as a risk factor, whilst the model described by Tangiisuran et al*,* (2014) was based on five clinical variables and called the BADRI (Brighton Adverse Drug Reaction Risk) model. This model is for predicting adverse drug reactions in elderly people during their hospital stay. The study included all patients aged ≥ 65 years admitted to a UK teaching hospital. Patients were screened and identified for a potential ADE and each event was further assessed to determine the relationship between the medications prescribed and suspected ADR. This was carried out using the Hallas algorithm where each ADR was classified as being either: definite, probable, possible or unlikely/doubtful. In doing this various pre-determined criterion had to be satisfied or not (Hallas et al*,* 1990). Additionally, to strengthen the methodology, an assessment of the causality of each event was rated by the reviewer using a six-point Likert scale described by Morimoto et al*,* (2004).

The six-point scale consists of:

1. Little or no confidence
2. Slight to moderate confidence
3. <50 percent confidence but a close call
4. > 50 percent confidence but a close call
5. Strong confidence
6. Virtually certain

Many variables were then collected for each patient in the BADRI study. Following multivariate analysis five clinical variables were found to identify an ADR risk for elderly

patients. These five variables were: hyperlipidaemia, number of medicines ≥ eight, length of stay ≥12 days, use of antidiabetic agents and high white blood cell count on admission. Each variable is given a score of one making it simple to adopt in clinical practice. However, in terms of applicability to this current study the BADRI study was related to inpatient events rather than events causing readmission.

In a more recent study a risk prediction model to identify elderly patients at risk of MRH following hospital discharge has been described (Stevenson et al, 2016). This is the PRIME study (Prospective study to develop a model to stratify the Risk of Medication-related harm in hospitalised Elderly patients), a multi-centre prospective observational study, following patients eight weeks after discharge to determine if they have experienced MRH. If the MRH was unclear this was reviewed by an 'End Point Committee' for a final decision. The process by which MRH was estimated utilised the Naranjo algorithm (Naranjo, 1981).

This algorithm is used as a method for estimating the probability of an ADR. In the PRIME protocol the Naranjo algorithm is used as a guide as some of the questions in the probability scale are not all relevant.

In this current study some of the methods in the BADRI and PRIME studies will be applied to assess whether the elderly patients in the cohort were readmitted due to the quality of MRI on the original discharge summary.

4.2 Study design

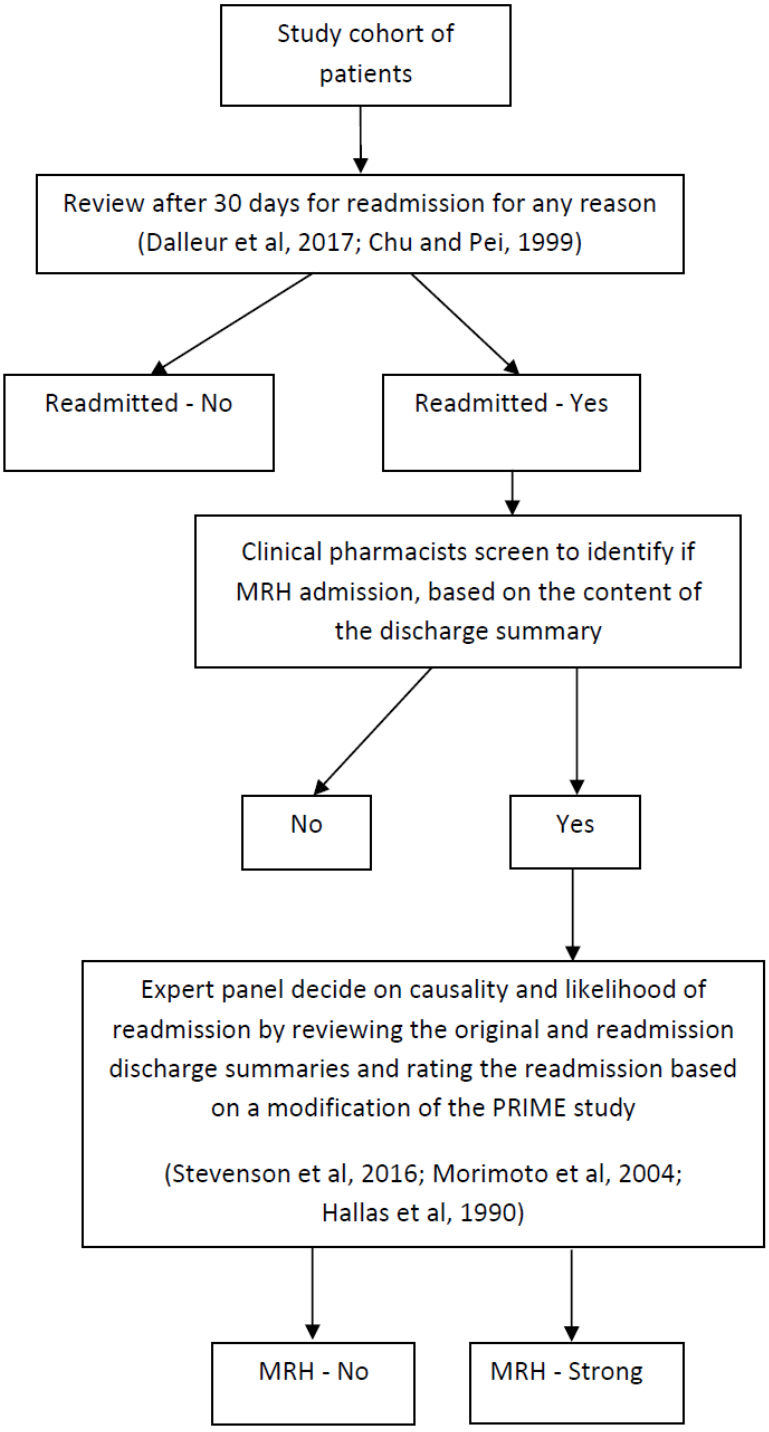

Figure 14: Flow diagram to illustrate the design and process for Phase III

Figure 14 shows the design and process for Phase III. Patients who have been readmitted due to potential MRH are assessed by an expert panel. This panel assess the causality and likelihood of readmission being due to the quality of MRI in the discharge summary.

4.3 Method

4.3.1 Data collection

The electronic hospital discharge summaries (Evolve®) were screened by the principal investigator for all 155 patients described in Phase II of the study at least 30 days after discharge to ascertain if they were readmitted to hospital or not. All patients who were readmitted into hospital were then identified. Patients were excluded if they were seen in the emergency department or an assessment clinic eg frailty clinic, after discharge and not admitted within 30 days after hospital discharge.

The patients who were identified after screening as being readmitted for whatever reason were then reviewed to ascertain if the cause could be medication-related or not. This was undertaken initially by the principal investigator by examining all the readmission discharge summaries. For example, some of the readmissions were due to a completely different reason not related to the original primary diagnosis following their first admission. Two senior pharmacists (clinical pharmacy manager and emergency admissions senior pharmacist) then validated these screened patients for further assessment by the expert panel for causality of readmission. The expert panel meeting was carried out in March 2017.

4.3.2 Setting and recruitment of expert panel

Phase III of the study was set in the same acute hospital as Phase I and Phase II described in Chapters 2 and 3. The expert panel was purposely recruited to obtain a consensus view on whether the readmission was due to medication and could potentially be caused by the quality of MRI in the original discharge summary. The principal investigator is also the chief pharmacist at the study site and made personal contact via email to senior consultants and senior pharmacists who had either an interest in the study subject due to their speciality or had expressed support for the study being undertaken.

4.3.3 Assessment of readmission causation

The expert panel members were given an anonymised version of the original discharge summary sent to the patient's GP. This discharge summary had been previously generated on the hospital electronic discharge system- Evolve®. The expert panel reviewed the discharge summary and was then given a further anonymous discharge summary relating to the same patient's readmission within 30 days of the first discharge

episode. The panel then used a modified version of the criteria for assessment of hospital readmission form used in the PRIME study to give a decision on the likelihood and causality of the quality of the discharge information related to medication influencing the patient's readmission to hospital (Stevenson et al, 2016 and Stevenson, personal communication, 2017)- see Table 50. The form used was adapted from that described in the PRIME study protocol, the six-point Likert scale of assessment of causality described by Morimoto et al, (2004) the Hallas algorithm (Hallas et al, 1990) and cognisant of the National Patient Safety Agency (NPSA) risk model matrix for risk managers where the likelihood of an event is rated against the consequence (NPSA, 2008).

Table 50: Criteria used for assessment of likelihood and causality of readmission due to MRI

Criteria for assessment of readmission due to MRI	Expert panel response
Patient admission due to medication? (a)	Definite
	Probable
	Possible
	Doubtful
Patient suffered MRH? (b)	Little/no confidence
	Slight/moderate
	<50 percent confidence but a close call
	>50 percent confidence but a close call
	Strong confidence
	Virtually certain
If MRH what was the main cause? (a)	ADR
	Non- adherence
	Other
	Unable to determine
Preventable? (c)	Definitely
	Possibly
	Not preventable
	Unable to evaluate
Was the readmission related to the quality of the discharge summary MRI? (b)	Little/no confidence
	Slight/moderate
	<50 percent confidence but a close call
	>50 percent confidence but a close call
	Strong confidence
	Virtually certain
Severity? (b)	Fatal
	Life -threatening
	Serious
	Significant

This assessment was adapted from that used by Stevenson et al, (2016) in the PRIME protocol. The following annotations refer to the original source of information and subjected to minor modification (see Appendix 2).

Key:

(a) From Stevenson et al, 2016 - PRIME study protocol

(b) From Morimoto et al, 2004

(c) From Hallas et al, 1990

The degree or level of severity in the assessment was taken from that described by Morimoto et al, 2004. Table 51 provides some clinical examples of how to apply the different levels of MRH severity due to MRI.

Table 51: Severity categories for consequences of possible MRH with examples

Definition of severity	Examples
Fatal	Patient died due to the incident
Life threatening	Patient transferred to ITU Respiratory failure requiring intubation Mental status change: patient falls and gets intracranial haemorrhage Tongue swelling/anaphylactic shock due to medication
Serious	Gastrointestinal bleed Altered mental status/excessive sedation due to medication Increased creatinine due to medication Decrease in blood pressure, patient feels lightheaded Allergic reaction: shaking chills/fever Additional visit to clinic for treatment or additional medication
Significant	Rash Diarrhoea due to antibiotics Nausea and vomiting due to medication Any significant event that is identified by the patient but not requiring a change in therapy

Adapted from: Morimoto et al, 2004.

In this study it is based on one site only and a single meeting of an expert panel was possible. The principal investigator did not participate in the assessment process but captured comments made and completed the documentation during the expert panel meeting.

4.4 Results

4.4.1 Recruitment of expert panel

At the study hospital the expert panel consisted of two senior pharmacists and six senior consultants and the principal investigator as facilitator. The expert panel composition is shown in Table 52.

Table 52: Composition of the expert panel for Phase III of the study

Profession	Title	Speciality (n)
Pharmacist	Clinical pharmacy manager (band 8b)	All areas (1)
Pharmacist	Senior pharmacist (band 8a)	Emergency Medicine (1)
Doctor	Consultant	Elderly Medicine (2)
Doctor	Consultant	Diabetes &Endocrinology (2)
Doctor	Consultant	Respiratory Medicine (1)
Doctor	Consultant	Haematology (1)

The expert panel in the study all met together and there was good agreement amongst all the participants about the criteria for readmission and there were no disputes.

4.4.2 Results of selection of readmission cases

Thirty-one of the 155 patients were readmitted into hospital or 20% of the total of study patients within 30 days of discharge. The demographic details of these patients can be found in section 3.7 and table 18. The reasons for the subsequent readmission were then reviewed to ascertain whether there was any potential association with medication. Seven patients were initially identified who could have had an association between medication and a readmission into hospital. The principal investigator undertook this initial review, and this was independently validated by two senior clinical pharmacists (clinical pharmacy manager and emergency admissions senior pharmacist) independently ie all pharmacists looked at the reasons for readmission alone.

Independent review by the principal investigator and two senior pharmacists:

- Seven patients identified due to possible medication-related readmission
- Six patients confirmed for analysis by expert panel

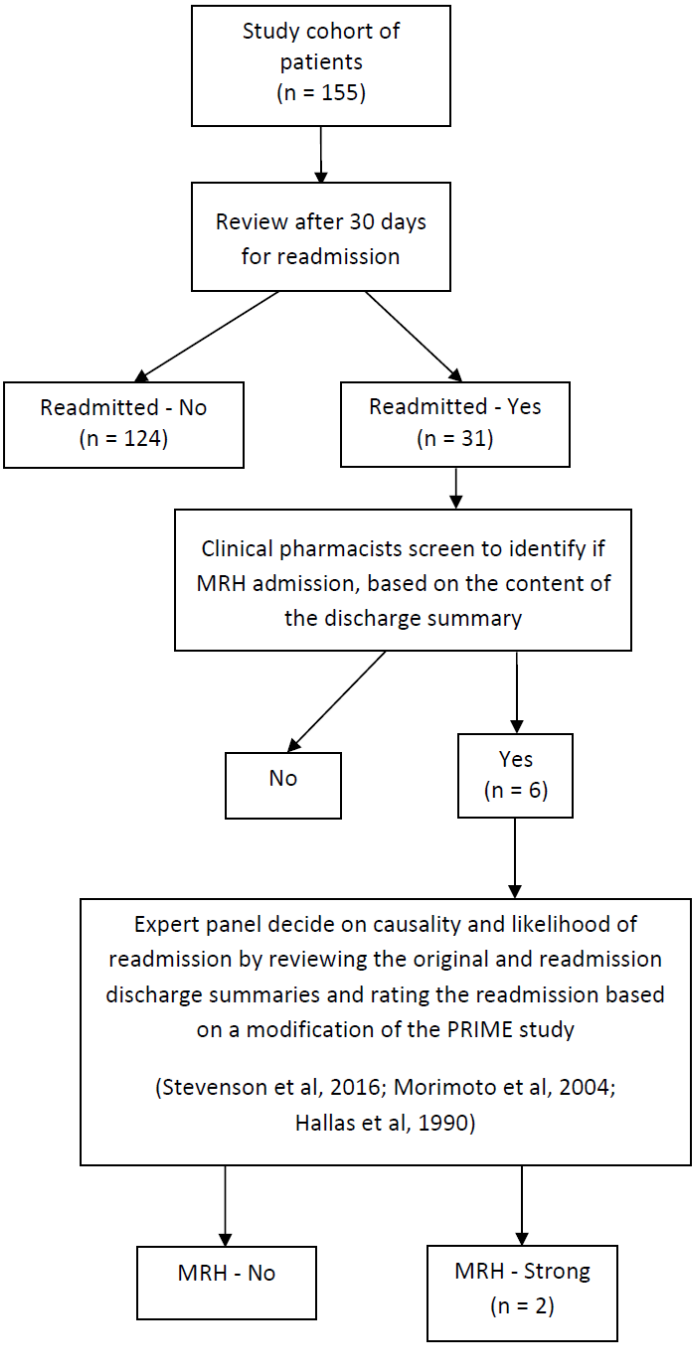

Figure 15: Flow diagram of the results of the expert panel assessment of causality and likelihood of readmission (Phase III).

Figure 15 shows the results of the expert panel assessment of causality and likelihood of readmission and MRH due to the quality of MRI in the discharge summary. This was undertaken by reviewing the original and readmission discharge summaries and then rating the readmission based on a modification of the PRIME study (Stevenson et al, 2016) and from Morimoto et al, 2004 and Hallas et al, 1990).

4.4.3 Results of assessment by the expert panel

Details of the six patients who were readmitted within 30 days of discharge possibly caused by MRH is shown in Table 53. There were four females and two males with an average age of 83 years and an average number of 10.5 medicines per patient. The level of the preventability of the readmission was assessed by the expert panel based on the clinical narrative in the discharge summary. For example, if a patient was discharged on too high a dose of insulin and was readmitted with hypoglycaemia then the preventability was considered as definite as the dose was too high.

Table 53: Showing some details of the six patients who were readmitted following discharge within 30 days

Patient ID	Gender	Age	Main diagnosis	Charlson age-adjusted index	Number of medicines on discharge summary
A23	F	92	Congestive Heart Failure	7	8
A29	F	88	Congestive Heart Failure	7	11
A39	M	69	Postural Hypotension	5	8
A79	F	92	Acute Myocardial Infarction	8	13
A114	F	88	Urinary Tract Infection	9	11
A154	M	89	Collapse	8	12

The results of the expert panel consensus view are presented in Table 54. These results demonstrate that of the six patients who were readmitted into hospital within 30 days two had a doubtful, two had a probable and two had a definite association with a medication-related readmission. Two of the patients had a strong-MRH (one 'definitely' and one 'probably' causing readmission) and one a 'virtually certain' ('definitely' causing readmission) likelihood of suffering MRH. Only one of these was thought to be a '>50% but close call' ('probable' cause of readmission) and one 'slight/moderate' ('probable' cause of readmission) relationship to the quality of MRI on the discharge summary. So, two (1.3% of total) may be associated with the quality of MRI on the discharge summary.

Table 54: Results of the expert panel consensus of patients readmitted

Patient ID	Patient readmission due to medication?	Patient suffered medication related harm?	If medication related harm what was the main cause?	Explanation of harm	Preventable?	Was the readmission related to the quality of the discharge summary information?	Severity
A23	Definite	Strong	Other	Over diuresis with Furosemide on discharge and readmitted with falls -dose and frequency reduced after readmission.	Possibly	Little/no confidence	Serious
A29	Doubtful	Little/no confidence	Unable to determine	Readmission not medication - related-due to UTI	Not preventable	Little/no confidence	Serious
A39	Probable	Little/no confidence	Unable to determine	Readmission may have been due to lack of Fludrocortisone that had been recommended in a frailty clinic visit after the initial discharge.	Possibly	Slight/ moderate	Serious
A79	Definite	Virtually certain	Other	Furosemide stopped and readmitted with heart failure. Clinical decision and not related to discharge information.	Possibly	Little/ no confidence	Serious
A114	Probable	Strong	Other	Readmission due to hypoglycaemia after too high a dose of Insulin on previous discharge.	Possibly	>50% but close call	Serious
A154	Doubtful	Slight/ moderate	Other	Bisoprolol stopped for low blood pressure but no monitoring specified and readmitted with atrial fibrillation	Possibly	Little/ no confidence	Serious

4.5 Discussion

In this preliminary study the number of patients who were readmitted within 30 days of the initial discharge due to medication was only six and therefore not subject to further statistical analysis. Of these six patients, only two patients were identified by the expert panel as having either a 'slight/moderate' or '>50% but a close call' confidence level that the readmission was related to the quality of the discharge summary information and assessed as 'probably' being caused by medication. In one case there was a lack of documentation after a follow-up assessment to commence fludrocortisone to treat postural hypotension and so was not directly related to the initial discharge summary. In the other case the patient was readmitted with hypoglycaemia after too high a dose of insulin was prescribed on the original discharge summary with no review specified. In both cases the consequences were considered serious and both were deemed as possibly preventable.

Nevertheless, despite the low number of patients identified from Phase III of the study there are still aspects of the study that have clinical implications on policy and practice and provide a basis for future research.

The expert panel convened for Phase III was composed of practising clinicians of six senior consultants and two senior pharmacists relevant to the study subjects (Jones and Hunter, 1995). This demonstrated that the panel members felt that the study was clinically relevant and could influence future practice. This would suggest that for any future research senior medical and pharmacy staff should be used as expert panel members. It may also be interesting for future research to look at other specialities with larger patient numbers to establish if there are any specific clinical requirements that could reduce readmission in these areas. Examples include oncology, paediatrics, surgery and mental health. For example, a recent study was carried out in orthopaedic surgery on the quality of discharge information for patients who have had hip surgery (Fitch et al, 2017). GPs highlighted information for the management of osteoporosis as an issue they wanted information on. In a similar manner, a recent study of the quality of discharge summaries from mental health hospitals has identified that psychiatric doctors in mental health hospitals may not be as competent with prescribing non-psychotropic agents compared with psychotropic agents on discharge and requires further study (Keers et al, 2015).

The expert panel made several qualitative observations regarding the practice of producing the discharge summary in relation to medication and generally how this influences the quality of the information. The senior consultants had mainly a medical background and speciality. They commented that some of the patients readmitted within 30 days of the initial discharge were not all medically stable for discharge although they were medically fit. There was some view that this was in part due to the bed pressures of the hospital and the need to discharge patients to release beds for emergency admissions. It was also noted that of the six patients readmitted, FY1 or 2 doctors only wrote two of the original discharge summaries. There was, therefore, an apparent lack of association with experience and training on the completion of a discharge summary and readmission due to MRI and requires a further study to understand why. It may be due to be lack of adequate training despite length of experience, human error or poor competency.

There was no correlation between the gold standard adherence overall score and readmission's, but this measure may not be sensitive to detect standard specific issues that may pose more risk of impacting upon readmission than others. There may be subtle issues that influence a readmission such as lack of advice to the GP on the monitoring required post-discharge eg insulin. Advice on monitoring post-discharge would include what to do, for example, if a patient's medication had been temporarily stopped on admission or a further dose titration was required. A further mixed-method study could be undertaken to establish hospital doctors' understanding and application of the 'gold standards' for a discharge summary for GPs and patients in a similar manner to the study from Yemm et al, (2014). This discussion will be explored further in Chapter 5.

The local policy of producing the electronic discharge summary as the patient's admission progresses was also recognised as a potential reason for a poor-quality discharge summary as any subsequent changes in medication may not have been made prior to submission of the final discharge summary if a verification, by a pharmacist at the point of discharge had not been undertaken. However, in this study all six patients readmitted had pharmacist verification of the initial discharge summary. There were also inaccuracies in the clinical narrative that was sent to the GP as there was no one who had responsibility for overall checking of the content of the discharge summary prior to sending to the GP. There was recognition that there was often insufficient advice for the GP on the monitoring and management of the patient after discharge. There was also an acceptance by the expert panel members that there are groups of patients that are

particularly affected by this. For example, in the study hospital patients with congestive heart failure may have limited access to a heart failure nurse specialist in the community. There is, therefore, a need to follow-up patients closely after discharge who have had a change in their medication following a hospital admission if no nurse is available to do this. This is evident if diuretics eg furosemide or agents used to control heart rate eg bisoprolol are altered, as there is a risk of relapse after discharge. This was observed in this small study in two of the patients - one with congestive heart failure whose diuretics were increased on the original admission and was subsequently readmitted with a fall. In this patient there was a definite association between the readmission being due to medication but not the MRI whilst the other patient, who had their bisoprolol stopped for low blood pressure, was subsequently readmitted with atrial fibrillation. In this case there was 'little/no confidence' that this was related to MRI on the discharge summary.

This reinforces the finding from Phase II that patients who are on cardiovascular medicines may be more at risk of poor quality medication-related information on the discharge summary than others. This supports the finding from a study of mental health patients that there are more errors with psychotropic agents rather than non-psychotropic agents suggesting that there may be a relationship between therapeutic classes and speciality of medical staff producing the discharge summary (Keers et al, 2015). This has implications for clinical practice as there appears to be little published evidence of the quality of discharge information related to therapeutic class types and speciality and identifies an area of future research (Keers et al, 2015).

There was also strong consensus amongst the expert panel that the quality of the discharge summary should clearly highlight the differences between the medicines on admission and discharge and give a clear justification for a change in treatment. There should also be a consideration to anticipate the future needs of the patient. Often after an acute episode treatment is reviewed and stopped or altered but after discharge, there is a need to review this decision as there is a potential for the original problems to recur, such as heart failure or atrial fibrillation. These and other issues will be considered in more detail in the discussion in Chapter 5.

4.5.1 Limitations of Phase III

The small sample size and single geographical setting clearly limit the validity and generalisability of the review of readmissions due to medication-related information on the discharge summary. It would have been beneficial to broaden the membership of the expert panel to include GP's and patients to gain a wider perspective. The time of following patients up after discharge for readmission within 30 days could be extended to a longer period - 90 days or even a year to establish if readmissions which may not be apparent immediately after discharge may occur later and have a latent effect not detected within 30 days.

4.5.2 Implications for policy, practice and future research

Even a small number of elderly patents readmitted due to MRH after a poor-quality discharge summary may have implications on clinical practice and policy. Whilst this is outside the scope of this thesis, a recent costing statement published by NICE (2015c) provides some idea of the scale of potential financial savings. NICE predicts that a reduction in avoidable medicine-related admissions may save commissioners up to £530 million per year in England. Whilst that due to poor quality of medication-related information would be lower, it would be an interesting area to consider as part of a larger multi-site research study.

Clearly, a further larger study following up patient's post-discharge for longer periods, eg 90 days or longer, may provide further evidence of the incidence of readmission and causality to the quality of MRI on the discharge summary and improve reliability and validity (Costa and Byon, 2018).

An implication for practice is that there may be value in a local expert panel meeting on a regular basis to review the quality of MRI on the discharge summaries for patients readmitted due to medication as a quality improvement project to improve practice and reduce future medication errors.

Chapter 5: General discussion

5.0 Discussion overview

In chapter four, Phase III of the study found no relationship between the quality of the discharge information related to medication and readmission to hospital of elderly patients. However, the method employed can be used to carry out a larger, multi-site study.

This study is the first recorded use of a modified e-Delphi technique to produce the essential standards of a discharge summary in relation to medication-information. The concept of a 'gold standard' content of a discharge summary for medication was considered. The level of adherence to the 'gold standards' in this study was found to be only 64.63%. The notion of a risk prioritisation score for a 'gold standard' discharge summary for medication-related information is proposed. The study provides a basis to undertake more comprehensive, multi-site collaborative research that could be used to develop a national consensus for 'gold standard' discharge summaries for medication-related information.

Despite recognition of the importance of a high-quality transfer of information from hospital to primary care, there is still a paucity of evidence on the adoption and value placed on interventions to ensure a high-quality discharge summary is produced (Unnewehr et al, 2015).

Elderly patients may suffer medication-related harm such as ADEs and/or hospitalisation after discharge. One of the aims of this study was to consider whether the quality of the discharge summary in relation to medication is associated with readmission to hospital. Whilst the results in this study were too small to detect an effect with only two patients probably having a readmission associated with the quality of medication information on the discharge summary, it is worthwhile considering some of the themes that have arisen from the study and their implications on future clinical practice, policy and research recommendations.

In considering these themes it is worth first considering the underlying approaches to human error theory and how these can be applied to this study. James Reason (2000), in

his seminal work on the models and management of human error as applied to healthcare, provides a good basis to work from. Reason postulated that most adverse events involve a combination of so-called active and latent failures. Active failures are the failure of an act by people who are in direct contact with the patient or system. Examples of these active failures include slips, lapses, mistakes and procedure deviations. Conversely, latent failures are those that arise by correct action of an inappropriate or incorrect plan. They often arise from decisions made by designers or policy makers and can translate into error producing conditions such as understaffing or inexperience or weaknesses such as unworkable procedures or poor design features. It is with these principles of error that a thematic discussion around some of the issues regarding the quality of the discharge summary in relation to medication will be considered, the application of human error theory where applicable, and strategies about how to reduce the risks to patients will be considered. The main themes, therefore, are related to: types of disease and medicines causing ADRs, discharge medicines reconciliation, design of electronic transfer of medication-related discharge information, education and training, use of prioritisation tools, standard setting, the patient perspective and use of performance indicators.

5.1 Themes that ensure best practice in producing a 'gold standard' discharge summary

5.1.1 Types of disease and medicines causing adverse drug reactions

An area of interest in terms of identifying elderly patients who may be at increased risk of hospital readmission is in relation to their diseases and medicines used to treat these. Medication errors due to the type of disease or medicines may derive from active failures such as slips or lapses or latent failures due to lack of familiarity by the prescriber.

Chu and Pei (1999) found that certain diseases such as chronic obstructive pulmonary disease, end stage renal failure, malignancy and congestive heart failure were associated with an increased risk of readmission in elderly patients. In this current study most of the patients had a primary diagnosis of either respiratory (32.2%) or cardiovascular disease (15.5%). Thus, it could be argued that it may be worth targeting patients with certain diseases and/or medicines such as cardiovascular disease or agents to ensure that the

content of the medication-related information on the discharge summary is optimised (see later section on risk minimisation stratification tool). In this current study ten out of 19 medicines stopped on discharge were not updated in the GP records, four medicines started out of 17 medicines not updated on the GP records and five of the 12 medicines where an ADE was not documented on the GP records were for cardiovascular medicines.

Anecdotal evidence from the expert panel members in Phase III of the study highlighted that it was important to document clearly in the discharge summary patients who required monitoring by the GP post-discharge. For example, patients on diuretics who had congestive heart failure, emphasising the need to prioritise this group of elderly patients. In this current study only 44 (28.4%) patients had any type of monitoring specified on their discharge summary. This highlights that the monitoring or review standard (E6) requires improvement. This may be achieved by raising awareness to hospital medical staff of the importance to specify this on the discharge summary and/or make this a mandatory requirement as part of redesigning the discharge summary template.

A risk factor for early hospital readmission in elderly patients is the type of medicine. Chu and Pei (1999) found that 5% of emergency readmissions were due to medication-related adverse effects. More recently in a UK study, 20% of patients were readmitted to hospital within one year of discharge (Davies et al, 2010). Anti-platelet or anti-thrombotic medicines and loop diuretics were the most common medicines causing an ADR. In a sub-group analysis of patients who were readmitted within 28 days of the original admission 23% experienced an ADR- related readmission. These figures were higher than previously reported at 5-10% (Nivya et al, 2015) and 13% (Dalleur et al, 2017) of readmissions due to ADRs. Interestingly, Dalleur et al, (2017) also found that 48.6% of readmitted patients were due to diuretics, analgesics or anti-thrombotics. This suggests that doctors should be careful when prescribing these classes of agents on discharge summaries.

In this current study, 31 (20%) patients were readmitted, with only six potentially due to a medication. There was limited adherence to the 'gold standard' discharge summary for patients on anti-thrombotic drugs (63.99%) and diuretics (64.61%) compared with the overall adherence score of 64.63%. These agents are identified as being a higher risk of causing an ADR so there is still room for improvement. The relationship with the discharge being that if the quality of the discharge summary is not optimised for high risk medicines

that elderly patients will be at a greater risk of readmission. This raises the question do certain medicines present a higher risk to the elderly and should these be prioritised when preparing a 'gold standard' discharge summary? This could form the basis of one of the main aims of a larger, multi-site research study.

5.1.2 Discharge medication reconciliation (DMR)

The transition of care from secondary to primary care, following an acute hospital episode, can be a vulnerable time with a risk of ADEs occurring following discharge (Armor et al, 2016 and Forster et al, 2003). These may result from discrepancies between the patient's post-medication regimen and the hospital discharge summary and be the result of an active failure (Coleman et al, 2005). The process of medicines reconciliation (MR) reduces the likelihood of medication errors occurring at care transition points (Kwan et al, 2013). Most of the work on MR in England has been undertaken in relation to admission MR (AMR) typically within 24 hours of admission. The premise being that the earlier an MR review is carried out after admission the less likely it is for the patient to suffer MRH due to an unintentional discrepancy between the prescribed medicines as an inpatient and pre-admission medication (NICE, 2007). In comparison, discharge medicines reconciliation (DMR) is less well-studied and is a more complex task, compared with an AMR (Wong et al, 2008).

DMR involves reviewing pre-admission medications, changes made during hospitalisation (medicines stopped, started and dose changes) and comparing them with the discharge prescription ensuring that all medications are appropriately continued, resumed or discontinued (O'Riordan et al, 2016). A flow chart has been published by the National Prescribing Centre in England to highlight the process of medicines reconciliation on patient discharge from secondary care to primary care highlighting optimal and sub-optimal practice (NPC, 2015). A recent systematic review of DMR identified that the median number of discrepancies found was 60% with an average of between 1.2 and 5.3 discrepancies per patient. This highlights the importance of DMR to improve patient safety (Michaelsen et al, 2015).

In this current study an attempt was made to establish whether there was evidence of reconciliation in primary care by accessing the patient's SCR. In terms of medication that was stopped during the admission, 10 (6.4%) patients had no update of stopped

medicines in their GP records. These were predominantly in patients over 80 years of age with a Charlson Co morbidity Index score of six or above. For these 10 patients there were 19 medicines.

Ten out of the 19 medicines, not updated on the GP records, did not have a reason for stopping indicated on the discharge summary. In a similar manner for medicines started, 10 (6.5% of total) patients did not have any documentation in the GP records for 17 medicines. Ten (59%) of these medicines had no comment on the discharge summary. For medicines where there was a change in dose of the medication on the discharge summary, there were only three patients that did not have their GP records updated for a total of four medicines. Of these medicines, two had no reason stated on the discharge summary. In a large collaborative audit of the quality of medication-related information in England when transferring patients from secondary care to primary care with DMR in primary care, 12.5% of patients did not have a DMR within seven days of the GP receiving the discharge summary for medicines that were started/stopped or changed, which is of a similar order to this current study if we assume that the lack of evidence of reconciliation in primary care is due to it not being undertaken (Shah et al, 2016).

These results demonstrate that unintentional discrepancies after discharge may occur. It is likely that the poor quality of the discharge summary contributes to poor reconciliation in primary care. O'Riordan et al, (2016) explored discharge prescribing errors post-discharge. In the study, 83 patients' discharges were analysed at least 10 days after discharge. They found that 36 (43.4%) patients had a post-discharge medication error with 32 affecting the patient. Unintentional prescription of an intentionally stopped medication and unintentional omission of active medication were cited amongst those medication errors most likely to persist after discharge. These medication errors were also found in this study and are examples of both active and latent failures. This reinforces the requirement to put measures in place to optimise the accuracy and content of the discharge summary regarding medication prior to discharge.

The verification of the discharge summary by a pharmacist prior to discharge may improve the accuracy and quality of the discharge summary (Abdel-Qader et al, 2010) and was also carried out in this current study although no relationship was found. Alternatively, pharmacists may prepare the discharge summary and prevent ADEs (Onatade et al, 2017; Tong et al, 2017). This has implications on future practice as there may be insufficient

pharmacists to either verify or write all discharge summaries. A further interesting study would be to compare the quality of the discharge summary between those that had been verified or written by a pharmacist and those that had not. In this current study 95.5% of patients' discharges were verified by a pharmacist so no comparison could be made.

A recent study of frail elderly patients over 75 years of age, who were referred for an electronic medicines reconciliation service undertaken by a pharmacist prior to discharge found that serious medication errors were detected prior to discharge and that the use of an information sheet may prevent additional errors at home (Agud et al*,* 2016). There is, therefore, a need to undertake further studies to assess the impact of DMR at discharge or post-discharge by a pharmacist to ascertain if the quality and accuracy of discharge information can be improved. Indeed, the principal investigator has been in discussion with the local GP lead for prescribing of piloting the role of a pharmacist, based in the hospital, to ensure that the discharge summary that is sent to the GP is accurate and then undertakes the DMR in primary care on behalf of the GP practice to improve safety. This has implications for a change in the way that the DMR is traditionally undertaken moving the role from primary care services to an interface role.

Jani et al*,* (2017) undertook an analysis of discharge summary reconciliations for 1,454 patients in England. The reason for initiation of new medicines was documented in only half of the 79% of patients where at least one new medicine was started. In this current study however, 91.6% of the patients who had new medicines started had a reason stated on the discharge summary. Whilst the sample size is a lot smaller in this current study one of the reasons for this could be attributed to the design of the discharge template. In the study hospital the electronic discharge summary template has the facility to add a reason for the medicine. Whilst this is not a mandatory field this may be why this improves the quality of the discharge summary in this setting and reduces latent errors.

Furthermore, Jani et al, (2017) found that any intentional changes to the primary care records after discharge were undertaken by the GP (51.5%), CCG or practice pharmacist (6.6%) or receptionist (5.6%). It is important to ensure that the content of the discharge summary is clear and easy to interpret as the reconciliation maybe undertaken, albeit in small numbers, by a non-healthcare professional. This demonstrated that GP practices need clear processes on how information provided on discharge summaries is managed

once received. There is a need to define who has the responsibility to review medicines on the discharge summary and who should action changes on the GP prescribing system.

If the quality of the discharge summary is high, then this will support the DMR in primary care following agreed procedures.

A relatively recent service development that is related to the quality of information about medicines and clinical practice is that of a post-discharge medicines use review (DMUR) service. In the UK it is recognised that improved discharge information is a key part of reducing unintentional medication changes, patient harm and hospital readmissions (RPS, 2012; Pherson et al, 2014). There is some evidence in the UK that community pharmacists can identify and resolve medication errors post-discharge (Nazar et al, 2015). Elderly patients may benefit from this service and a targeted DMUR service may reduce healthcare costs and improve patient safety (Ramsbottom et al, 2018). In the study by Ramsbottom et al, (2018) 20 patients over the age of 65 discharged from a hospital had a DMUR within 28 days of discharge. Whilst the number of patients was low, 17% of interventions involved medicines reconciliation to resolve discrepancies between pre-admission and discharge medications that were intentional. Clearly if a community pharmacist undertakes a DMUR then having access to a high-quality discharge summary will reduce the likelihood of unintentional discrepancies, reduce risk and make the DMUR more straightforward.

Electronic (e) discharge referral systems between hospital and community pharmacists are currently being rolled out across the NHS in England with support from some Academic Health Science Networks. The e-referral services consist of web-based platforms such as PharmOutcomes® (Pinnacle Health Partnership LLP (PHP), 2018) or Refer to Pharmacy® (ELHT, 2018) which allow a secure method of electronic transfer of information related to medicines between hospital and the patient's community pharmacy (Nazar et al, 2016). Whilst initial evidence of uptake has been low (30.5%) by community pharmacists after referral from hospital this is now increasing (personal communication, Dines-Allen, 2018) and there is early evidence that this may result in lower rates of readmission and reduced length of stay in hospital (Nazar et al, 2016). In the e-referral study most of the patients referred were elderly and had cardiovascular or respiratory disease. Eighteen percent of the referrals made were related to the issue of a new medicine, 7.3% due to a change in dose and 7.0% due to medication stopped in the

hospital. The study highlighted deficiencies in the e-referral process to a community pharmacist of the lack of quality information related to medication and therefore demonstrates once again the need for 'gold standard' information on the discharge summary to optimise patient safety and reduce hospital readmissions. A further study is currently underway to develop a consensus for referral criteria of hospital inpatients for follow-up by a community pharmacist and there is an opportunity to further develop a national 'gold standard' package of measures to improve discharge information to support this referral and follow-up process (personal communication, Nazar, 2018).

The schematic below indicates a conceptual framework for the flow of information related to medication and the complexity of ensuring that patient safety is maintained at the key points of transition of care (Figure 16).

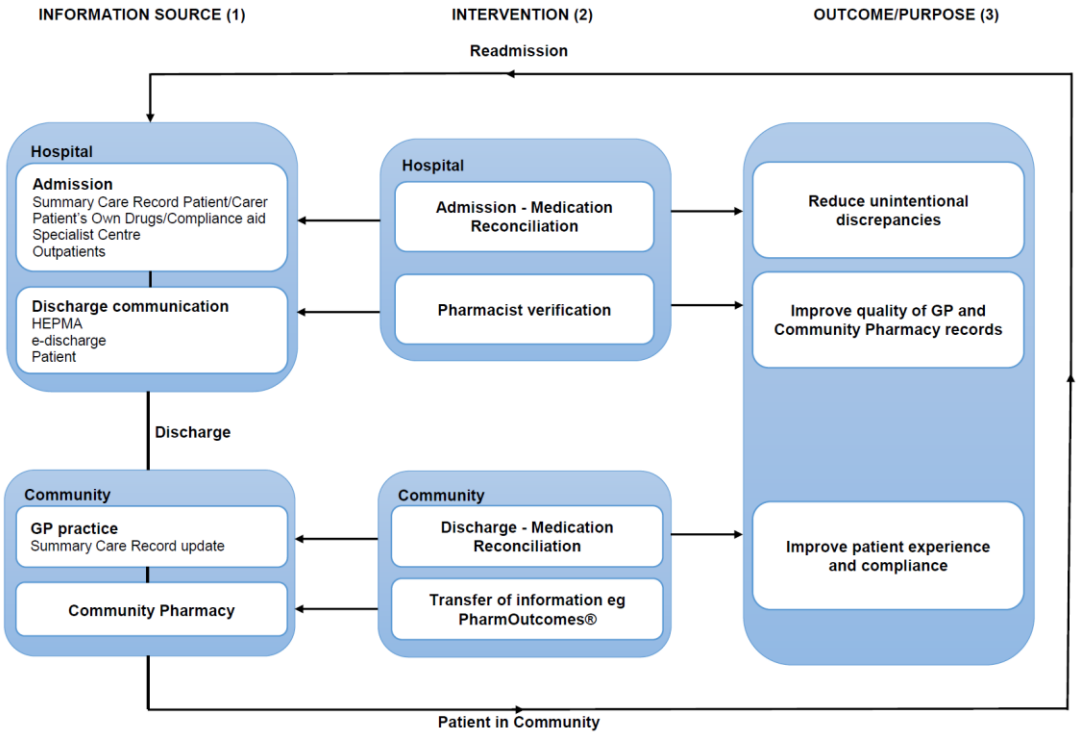

Figure 16: A schematic of a conceptual framework for the flow of medication-related information at the transitions of care for a patient

The conceptual framework in figure 16 shows the flow of medication related information at transitions of care, interventions that can influence the quality and accuracy of the information and potential patient safety outcomes.

Key:

1. Information sources related to medication at the points of transition of care in hospital and community in relation to admission and discharge.
2. Interventions carried out at the points of transition of care in hospital and the community such as AMR, DMR, verification of the discharge summary and transfer of information.
3. The purpose and potential outcome to the patient from the interventions carried out to determine the quality and accuracy of MRI and patient hospital (re)admission.

The proposed conceptual framework regarding the flow of medication-related information considers the inter-relationship between the patient journey on transitions of care between hospital and the community settings and interventions that may have a positive or negative outcome for the patient. It is interesting to consider that interventions have traditionally focused on healthcare professionals such as pharmacists and doctors. However, further quality improvement initiatives should involve patients directly as they have a vested interest in ensuring that there is optimal communication of medication-related issues.

5.1.3 Design of electronic transfer of medication-related discharge information

The usual way of communicating hospital discharge information to the patient's GP in the UK has been by handwritten methods. This typically consisted of a review and transcription of the inpatient prescription to another paper document sometimes referred to as the immediate discharge letter (IDL). The IDL may be followed up by a more comprehensive discharge summary. Nowadays the IDL is commonly also the final discharge summary sent to the patient's GP. The paper document is usually based on a template with the potential to add relevant medication for discharge. The discharge summary may have been clinically verified by a pharmacist prior to discharge and sending to the patients GP. More recently, developments in information technology (IT) have allowed the introduction of electronic transmission of discharge summaries although uptake is still variable. In 2013 a recommendation was made for standardisation of electronic discharge summaries in the EU but the vote by the UK to leave the EU may mean this standard will not be realised (Knai et al, 2013).

Despite recommendations being made for the 'gold standard' content of a discharge summary in relation to medication by several organisations as previously discussed the actual adoption of this standard has been variable (RPS, 2012; SIGN, 2012; NICE, 2015b; HSCIC, 2013 and PRSB, 2017).

Clearly, adopting a well-designed electronic (e)-discharge system of transfer of discharge information offers the potential to improve the efficiency and accuracy of medication-related information going to the patient's GP and reduce latent errors (Lehnbom et al, 2014; PRSB ,2017; Blain, 2011 and Mills et al, 2017b).

Interestingly, if the e-discharge summary is poorly designed then the benefits can be lost and lead to confusion about medication information (Sarzynski et al, 2017). Also, a HEPMA system generating an e-discharge summary does not always mean that it guarantees reconciliation with the medication the patient is discharged on (Tan et al, 2018).

The PRSB standards recommend that implementation guidance should be provided about how to present medication information in the electronic discharge summary safely although there is a lack of actual guidance (PRSB, 2017).

There are also fundamental differences in the design of HEPMA and GP prescribing systems that will need to be considered in future system design and integration. An example of this is the difference between 'dose-based' prescribing in hospital versus 'product-based' prescribing in GP practices. In hospital the dose is not dependent on the product strength and this was demonstrated in this current study where only 6% of medicines had the strength specified on the discharge summary. The challenge will be for an integration between HEPMA and GP prescribing systems so there will be a common terminology and recognition between the two so that these variations will be considered on the electronic transfer of information (PRSB, 2017).

Despite UK policy to promote and implement HEPMA systems within the NHS, uptake is still variable. A recent report from a Department of Health convened Short Life Working Group on reducing medication-related harm found that only 35% of acute trusts were reporting roll out of HEPMA where greater than 80% of inpatient prescriptions were written digitally and less than 12% of mental health organisations in November 2017

(Department of Health, 2018). This important report has recommended the need to accelerate roll-out of HEPMA in England. However, this is not without some caution as poor design of HEPMA may contribute to latent failures and different types of medication errors.

An example of this is the need to regularly review and update national guidance to inform best practice. An e-prescribing toolkit is available to assist hospitals to install and use HEPMA (e-prescribing, 2007) and specifies essential delivery priorities to implement including a section on the general requirements of a system for discharge. These requirements are shown in Table 3 in Chapter 1 but are shown here for ease of reference and compared with those found from the modified e-Delphi study carried out and other recommended standards (Table 55). Interestingly, the e-prescribing toolkit does not include a reason for the medicine ie indication (D9) which was found in the desirable standards in this study and route of administration (E1) which was an essential standard identified in this study.

Table 55: Comparison of discharge summary core contents

Core Content	RPS (2012)	SIGN (2012)	Academy Medical Royal Colleges (HSCIC) (2013) and PRSB (2017)	HIQA (2013)	NICE (2015b)	e-prescribing (2007)	Current Study
Patient details	✓	✓	✓	✓	✓	✓	NS
GP details	✓	✓	✓	✓	✓	✓	NS
Other relevant contacts eg community pharmacist, nurse	✓	✓	✓		✓		✓(D12)
Current medicine (generic name)	✓	✓	✓	✓	✓	✓	✓(E3a)
Dose	✓	✓	✓	✓	✓	✓	✓(E3b)
Reason for medicine (indication)	✓	✓	✓	✓	✓		✓(D9)
Dose strength	✓	✓	✓		✓	✓	✓(E4a)
Formulation	✓	✓	✓		✓	✓	✓(E4b)
Dose frequency/ time	✓	✓	✓	✓	✓	✓	✓(E3c)
Route	✓	✓	✓		✓		✓(E1)
Duration of treatment (stop date or review)		✓	✓	✓	✓	✓	✓(E2 and E5)
Number of days of supply		✓	✓			✓	
Medicine changes and reasons	✓	✓	✓	✓	✓	✓	✓(D6) (E7a&b)
Aids to compliance		✓	✓	✓		✓	✓(D11)
Allergies and conditions	✓	✓	✓	✓	✓	✓	✓(D4)
Monitoring or review requirements			✓				✓(E6)

D = Desirable standard

E = Essential standard

NS = Not Studied

There is, therefore, good congruence between the standards of content of a discharge summary related to medication and that recommended by the RPS, (2012); SIGN, (2012);

Academy of Royal Colleges; HSCIC, (2013), PRSB, (2017), HIQA, (2013), NICE, (2015b) and e-prescribing toolkit, 2007.

However, there are some subtle differences as shown in Table 55. This current study identified that review and monitoring were essential standards whereas the quantity supplied was not identified as being an issue. This may be because GPs are familiar with the local arrangements for quantities to supply on discharge but wanted more practical advice on how to monitor the patient post-discharge. It is worth noting that despite the recommendations to employ HEPMA in UK hospitals, that the e-prescribing toolkit, with the general requirements of the discharge summary, was last updated in 2007 and needs to be reviewed. Furthermore, the low uptake of HEPMA in the UK has been compounded by the introduction of a wide-range of products that have been developed by both UK and non-UK suppliers. Mozaffar et al*,* (2014) found there were 17 different systems available in the English market but only half were designed and developed by UK based suppliers and potentially more aware of the systems use in the NHS. There are also several specialised HEPMA products in use eg chemotherapy, intensive care and mental health. This reflects a diverse range of suppliers, functions and uses. Consequently, there is a lack of standardisation of definitions and distribution of functionality across, and within, systems and means there are latent safety risks with these products which include the risk of medication error. Mozaffar et al*,* (2017) carried out a qualitative study of the implementation and adoption of HEPMA in six English hospitals to explore unintended consequences of errors introduced. The study identified themes associated with patient safety which included inadequacy of system design. Whilst this current study did not focus on system design in relation to the content of a discharge summary, there is recognition that either a HEPMA derived discharge summary or standalone e-discharge summary need to integrate in some way with the GP primary care system and incorporate the gold standards for discharge medication information.

Several other initiatives have been considered for improving e-discharge information with varying success. Maurice et al*,* (2014) introduced an electronic prompting system to assist with entry of the correct information on a discharge summary, although, in this case it did not improve the quality of discharge information. Whilst in Norway there was limited effect of using a structured medication report prepared by a pharmacist in addition to the normal electronic discharge summary (Holdhus et al, 2018).

A more locally-owned approach to system design was that employed by May-Miller et al, (2015). This consisted of a quality improvement project to improve the quality of discharge summaries in a hospital that used two different electronic discharge systems. Using the Academy of Medical Royal Colleges standards for discharge they designed a new template that was compliant with these standards (HSCIC, 2013). The median compliance with the standards improved from 67.9% to 75.7% and provided an example of how to embed best practice standards in the design of an electronic discharge system which can improve patient safety. However, the design of the discharge summary template did not consider the views of GPs or patients and should be considered as part of any future developments (Mahfouz et al, 2017).

In this current study the results for some of the 'gold standards' are very high with adherence >90%, eg route (E1), generic name (E3a), dose (E3b) and frequency (E3c). An explanation for this maybe because the design of the Evolve® discharge summary template had considerable input at the time by senior pharmacists and it was stipulated that this was a minimum dataset requirement. This gives a practical example of how the appropriate design and implementation of an electronic discharge system can influence the quality of a discharge summary.

Efforts should be made to ensure that the next generation of HEPMA products adopt a standardised approach to having a minimum dataset of content of a discharge summary based on the gold standards. It is therefore recommended that future studies are carried out to agree a national gold standard and evaluate their impact on the quality of information generated from an HEPMA system.

5.1.4 Education and training issues

An important issue when considering themes and strategies to reduce the risk of medication errors in elderly patients at discharge is that of the experience and education and training undertaken by doctors who complete the discharge summary. A lack of sufficient training would cause a latent-type error. It has been suggested that discharge summaries reviewed by a senior doctor prior to discharge may improve quality (Wilkin et al, 2018). However, consultants do not generally have enough time to undertake this duty and most are written by a junior doctor, FY1 or FY2 level, with 71.6% in this study and up to 86% in the report by Dornan et al, (2009). Junior doctors often rely on a pharmacist to

check the accuracy of a discharge prescription with 95.5% in this current study but cannot be guaranteed all the time. In this study FY1 and FY2 doctors had an adherence score for the essential standards of 64.09% and 66.15% respectively and at a similar level to the average score (64.63%). Interestingly the lowest scores were for ST2 level medical staff at an adherence score of only 57.57%, albeit with a small sample size of five. Consultants scored lower than FY1 and FY2 medical staff at 61.85%. It is possible that because senior doctors do not routinely complete the electronic discharge summaries they are less familiar with the requirements for adequate completion. It would have been anticipated that the more experienced medical staff would score higher on the adherence to the 'gold standards'. Irrespective of the level of medical staff involved with the production of the discharge summary, there was still room for improvement.

There has been a recent renewed emphasis on the training requirements for junior doctors to reduce medication errors. The Royal College of Physicians (RCP) has produced a guide to support junior doctors in safer prescribing recognising that they are not adequately supported to prescribe safely (RCP, 2017). Several key recommendations are made which include providing education and practical resources to support prescribing at discharge such as an induction programme in safe prescribing, incorporating prescribing into the wider curriculum for junior doctors and assessment of prescribing competency.

Gilbert et al, (2017) carried out an audit of the quality of medication information in electronically-generated discharge summaries in Australia. Strikingly, in the audit of 76 patients, none of the electronic discharge summaries included a documented reason for a change to the medicines despite a standard template for discharge being available. Consequently, an action plan was implemented which included engagement with the medical consultants to discuss the importance of accurate discharge summaries and training in how to complete a discharge summary well. However, no results have yet been published of the value of this intervention but does demonstrate a strategy that could be employed.

Medical staff in hospital may not be aware of the importance of the information on a discharge summary for the GP. Yemm et al, (2014) found that both GPs and junior doctors considered that accuracy was the most important characteristic of a discharge summary. The GPs valued the explicit inclusion of details of medication changes more than junior doctors and indicated that junior doctors often lack awareness of how GPs use

information about patients after discharge as part of the DMR process. The junior doctors reported a lack of training and guidance to produce a discharge summary and the use of a guide as described by May-Miller et al, (2015), which included real-life scenarios raised by local GPs, would be a useful quality improvement initiative. Tan et al, (2015) in a follow-up study to an audit carried out in 2014, which demonstrated that only 50% discharge summaries had any information about indication documented, provided training, feedback and an incentive (a voucher for free coffee) to improve the quality of discharge information (Tan et al, 2014). This resulted in a 30% improvement in information about medication indication. Yemm et al, (2014) also found that intra-professional education between primary and secondary care doctors may improve the quality of discharge summaries

Ryan et al, (2014) investigated the prevalence and causes of prescribing errors in junior doctors in clinical training. Whilst the prescribing errors for patients being discharged (14.5%) were less than those on admission (56.7%) the doctors involved highlighted that they were under pressure to discharge patients quickly, there was a lack of uninterrupted time to write the discharge summary and lack of previous involvement in the patient's care - all examples of potential latent failures. So, any training provided should be protected and targeted to the type of speciality or location of work (Keers et al, 2015 and Hammad et al, 2014).

A combination of targeted-education, feedback and token incentives can improve the quality of information on discharge and should be considered as a strategy that could be used locally.

5.1.5 Concept of a discharge summary prioritisation tool and risk rating of a discharge summary

A challenge for healthcare professionals is how to provide high-quality care to patients that optimises outcomes and patient experience in the context of increasing complex treatments and limited time and staff. This has led to pharmacists considering the use of prioritisation tools to target care they can provide. A clinical prioritisation tool for pharmacists or assessment of risk tool (ART) has recently been validated (Falconer et al, 2017). The ART is an electronic tool used to stratify patients into those at high, medium and low risk for medication errors and ADEs. A risk factor includes polypharmacy ie >8

medicines per patient. The same principles could apply to junior doctors who also have limited time to complete a full discharge summary (Ryan et al, 2014). A risk prioritisation approach can therefore be considered using information about patients, diseases or treatment to stratify their risk of developing an event (Tangiisuran et al, 2010).

Onder et al, (2010) developed and validated a risk assessment tool to identify ADRs in hospital patients over 65 years old - the GerontoNet ADR risk score. The strongest predictor of an ADR was the number of medicines the patient was on, particularly those on eight or more medicines. The Medication Regimen Complexity Index (MRCI) devised by George et al, (2004) is a tool that quantifies medication regimen complexity according to an individual patient's medication. The MRCI tool considers features such as number of medications and doses per day, frequency of administration, additional information directions and route of administration. Willson et al, (2014) used the MRCI to examine the association between discharge medication regimen complexity and subsequent readmission to hospital due to an ADE. However, because the MRCI did not change significantly during the hospital stay the admission MRCI value was used as a predictor of post-discharge ADEs leading to readmissions. More recently a risk model for predicting ADRs in elderly people during hospital stay has been described, the BADRI model (Tangiisuran et al, 2014). This tool was validated and used as an ADR risk score in patients with a median age of 85 years based on five clinical variables namely: ≥8 medicines, hyperlipidaemia, raised white cell count, use of anti-diabetic agents, and length of stay ≥12 days. It is therefore proposed as a future area of research to consider the development of a risk prioritisation tool to assist in the prioritisation of elderly patients, who may be at risk of an ADR following discharge from hospital due to a poor-quality discharge summary, to have a high-quality discharge summary. So, when time and resources are limited a high 'gold standard' adherence discharge summary score can be produced.

There is no specific risk minimisation/prioritisation tool in the literature to target patients who require a 'gold standard' discharge summary for medication being completed. So, from this current study it is proposed the following tool is considered. This is based on key factors/variables from this current study that contribute to the quality of a discharge summary related to medication. This also relates to the conceptual model described earlier whereby to optimise the outcomes for the patient it is important to ensure that high priority discharge summaries are completed to a high standard. For example, in this

study this could be reflected in a score of >80% adherence to the 'gold standards' as an example.

The proposed 'Quality of Medication for Discharge' (Q-MedDis) tool by the principal investigator is described in Figure 17 below as a hypothetical model for elderly patients highlighting the various factors/variables that should be considered.

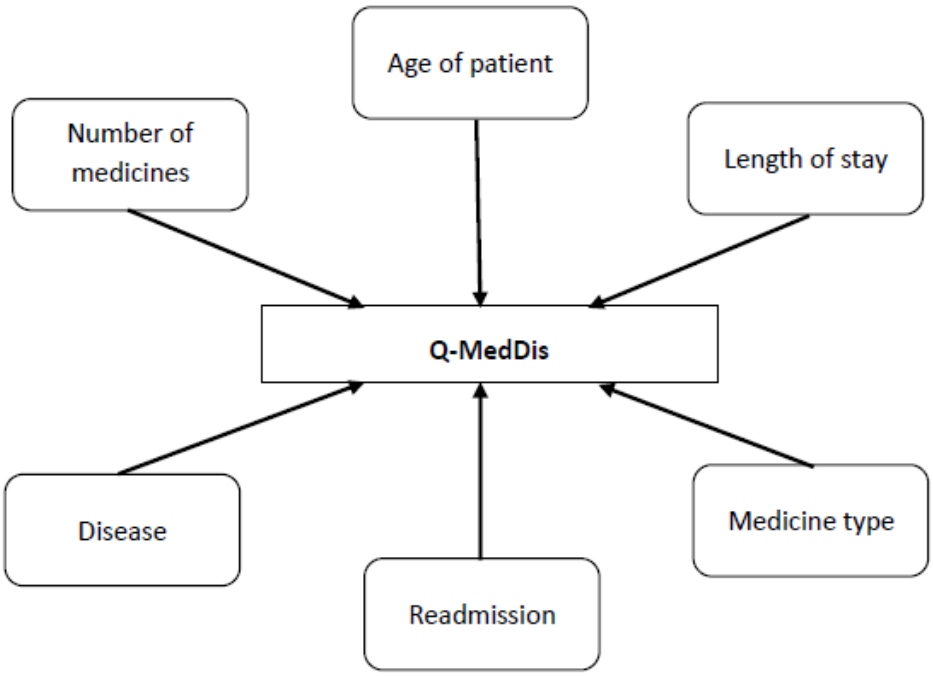

Figure 17: A schematic to show the factors that may lead to a risk prioritisation tool to target patients who would benefit from a 'gold standard' discharge summary being completed - Q-MedDis.

Although the current study failed to identify factors that affected the quality of the discharge information related to medicines, the following have been previously reported in the literature as being associated with the elderly experiencing an ADR. Consequently, they could highlight patients that require prioritisation to produce a high-quality discharge summary and are considered below:

1. Number of medicines and age of patient- there is evidence from Onder et al, (2010) and Tangiisuran et al, (2014) that elderly patients on eight or more medicines are highly likely to suffer an ADR particularly in the oldest old ie ≥ 85 years of age.

2. Length of stay- on the basis that elderly patients with a length of stay ≥ 12 days have an increased likelihood of developing an ADR (Tangiisuran et al, 2014) and that 10 days of bed rest can lead to significant deconditioning and increase susceptibility to an ADR (Vernon, 2016).
3. The presence of certain diseases eg heart failure, renal failure have been found to be associated with an increased risk of an ADR (Onder et al, 2010).

4. Readmission is included because patients on complex medication regimens may be at increased risk of readmission (Willson et al, 2014). This may be associated with the quality of information on the discharge summary.

5. Medicine type is included on the basis that in this current study certain types of medicines were found to have a lower quality of discharge adherence score ie antithrombotics, loop diuretics. Tangiisuran et al (2014) also found that antidiabetic agents may be a risk factor for predicting ADRs in elderly people.

Patients at high risk of MRH could be prioritised to receive a 'gold standard' discharge summary as a minimum if they satisfy the following criteria: on ≥8 medicines, ≥85 years old, with a length of stay of ≥12 days, presence of cardiovascular and/or respiratory disease, who have been readmitted within 30 days and are on an anti-thrombotic and/or loop diuretic agent.

It should be emphasised that this tool is a proposal only and would need further research and validation. The basis of the factors chosen are from those identified in this study, the MRCI, the BADRI tool and the GerontoNet ADR risk score (Willson et al, 2014; Tangiisuran et al, 2014 and Onder et al, 2010).

A future comparative study could be designed to test the risk prioritisation tool by measuring the quality of the discharge summary that was produced as the 'gold standard' using 'Q-MedDis' as a test group and compare this with a control arm where no intervention is made. The outcome measures could include the incidence of readmission, incidence and type of medication discrepancies found after DMR in primary care and the extent of medication-related harm post-discharge.

5.1.6 Standard setting

The development of a local gold standard for the quality of medication-related information of a discharge summary in this current study and the variable adherence with this and the other published compliance levels to standards has highlighted the need for a national standard (Aziz et al, 2016 and Hammad et al, 2014). A recent Dutch study in 20 hospitals found that 15% of discharge summaries were missing details of changes in medication in the discharge summary. One of the reasons for this was considered a lack of standards outlining the contents of a discharge summary (Langelaan et al, 2017).

The recently published PRSB standards updated the HSCIC standards from 2013 and outline 'good practice requirements' (PRSB, 2017). Medicines are considered as information that is required to be sent to the GP. Within this the information element may be either mandatory or optional. The PRSB standards only identify four medication elements to have mandatory status: medication name, name of medication discontinued, nature of any change made to a medicine since admission and medicine name causing an allergy or adverse drug reaction. The PRSB standards do not consider the 'medication changes' heading as mandatory as it was felt that this would mean that 'no changes' would be recorded rather than taking time to complete the section correctly (PRSB,2017).

The number of elements for medicines in the detailed general hospital discharge spreadsheet available on the PRSB website published in February 2018 is 38 (PRSB, 2017). Whilst it is recognised that this is an up-to-date resource that will be used to influence the NHS standard contract and design of HEPMA systems there will be some challenges at a local level to ensure all the standards are completed. This current study therefore provides a model to inform local decision making on the requirements of the gold standards of a discharge summary. In addition, NHS Digital who are responsible for the implementation of the e-discharge standards will need to consider how to make this happen at organisation level (PRSB, 2017). This preliminary study provides a pragmatic approach to implement a local standard.

5.1.7 The patient's perspective

It is known that patients are generally concerned about waiting too long for their medication prior to discharge from hospital and there is a lack of counselling by pharmacists. Indeed, in one study over a third of patients were unclear what medicines

they should take after discharge and suggests the quality of information given to patients is poor at discharge (Wright et al, 2017).

Ziaelan et al, (2012) in a prospective study in the USA of 337 elderly patients found that only 53.2% understood about intended medication changes at discharge and prompted a need to improve patient education at the point of discharge.

An aspect of medication safety that has emerged is the lack of patient involvement to support a reduction in medication errors. This may be of more relevance to patients on long-term medicines or high-risk medicines eg insulin. The notion of an expert patient is not new but there is some evidence that expert patient educational programmes have limited impact (Griffiths et al, 2007). Some patients will be more motivated than others to be engaged in their management of medicines but may not be involved. Bullock et al, (2017) evaluated the views of 13 senior pharmacists in England about the hospital discharge process. A significant finding was that patients had limited involvement in their own discharge from hospital and there was a deficiency in patients being counselled about their medicines. Garfield et al, (2016) also found that patient engagement or involvement in medication safety is limited during the inpatient hospital episode of care.

Mackridge et al, (2017) carried out a survey of patients' needs for information and support with medicines after discharge from hospital. Interestingly, they found that patients who felt that the information was insufficient were most likely to report needing post-discharge support. There was quite a lot of variation between hospitals in the way information about medicines was provided to patients. A recent study from Australia reported a thematic analysis of the views of 506 patients who had been discharged from hospital within the previous month of medication-related problems. Patients were eligible to participate in the study if they were on five or more medicines, over the age of 50 and had been in hospital for 24 hours or more (Eassey et al, 2017). A concern found in the study was that most patients reported that they felt confused about the changes in their medication following discharge from hospital. The types of concerns expressed included possible side-effects and not being told about new or stopped medications. In a separate quantitative study of the same cohort of patients it was found that the most commonly used medicines were pain relievers, cardiovascular medicines, cholesterol medicines and vitamins and supplements (Eassey et al, 2016). In this current study cardiovascular medicines accounted for 21% of all medicines and again demonstrates the

need to prioritise this class of medicines for high-quality discharge information and specific patient counselling.

Patients (or their carers) will usually be the only consistent part of the transition of care process and may be able to prevent potential medication errors themselves and so reduce active and latent errors through their own knowledge and engagement. It is important if patients are to be involved that the discharge information is understandable, and key information is pointed out (Cua and Kripalani, 2008). If patients are more involved with the production and understanding of the discharge summary at the point of discharge this may result in a reduction in MRH post-discharge.

A recent innovation is the use of a patient's personal health record across transitions of care to improve the quality of information (Greenwald et al, 2010). It is recognised that there is still a lack of agreement on the most effective method to carry out medicines reconciliation (Kwan et al, 2013). An electronic Patient Held Active Record of Medication Status (PHARMS) feasibility study will assess whether the introduction of an electronic medication record is possible in primary and secondary care. The electronic patient-held medication record device may provide a link to the patient's GP medication record via a Universal Serial Bus (USB) point of a computer. If this feasibility study is successful then it will provide an opportunity to improve the quality of information flow about medication at discharge and admission and involve the patient in the medicines reconciliation process (Walsh et al, 2018).

This current study provides further evidence of the consequences to a patient about the lack of adequate documentation and communication about changes to medication when listed on the discharge summary especially if they have cardiovascular disease.

The consequence of these findings suggest again that further research needs to be carried out to assess the benefit of involving the patient in the production and understanding of the contents of a gold standard discharge summary. In clinical practice patients may be given a copy of the electronic discharge summary in paper form and this provides an ideal opportunity to assess their views about the type and format of information contained within the discharge summary and their understanding of its contents.

5.1.8 Quality of discharge summaries performance indicators

There is a need for discharge summaries to be of a high quality to support patients post-discharge (Kripalani, 2016). There is also considerable cost in introducing a HEPMA system and there is a need to evidence a return of investment by focusing on certain quality indicators which measure system impact (Cresswell et al, 2016). There is still some considerable variation in the NHS about the functionality and adoption of HEPMA and this will consequently affect the quality of information on discharge in relation to medication and indicators of performance (Mozaffar et al, 2014). It is proposed to consider a measure of the quality of discharge summaries as a local and national performance management tool when either e-discharge or HEPMA-generated discharge summaries are produced.

A local hospital discharge performance indicator was described by Singh et al, (2015). A hospital discharge scorecard was used as a quality improvement tool. An exemplar high quality discharge summary was used as a standard to train junior doctors who were subsequently given feedback at intervals on how well they improved the quality of the discharge summaries. There is the potential to use a similar type of performance indicator such as the level of adherence to the gold standards as a local hospital-wide indicator to measure the quality of discharge summaries.

At a national level it is recommended to introduce a national 'gold standard' for discharge summaries related to medication performance score. The gold standards in this study could form the basis of the performance score with a method of scoring adapted from that described by Aziz et al, (2016).

Compliance of organisations with this performance standard could be assessed on an annual basis via the Pharmacy NHS Benchmarking exercise (NHS Benchmarking, 2017), incorporated into the benefits realisation guidance for e-prescribing projects (Slee, 2014) or report to the NHS Improvement (NHSI) Model Hospital dashboard (NHSI, 2018).

The Model Hospital is a digital information service designed to help NHS providers improve productivity and efficiency. The Model Hospital is part of NHS Improvement and contains a component related to pharmacy and medicines to reduce unwarranted variation (Carter, 2016). The pharmacy and medicines dashboard has a wide array of metrics to assess performance which include safety and effectiveness. It is proposed

therefore to include a metric related to the quality of discharge summaries in relation to medication.

5.2 Implications and recommendations for policy, practice and research

In a systematic review of measures to improve the quality of discharge summaries many similar themes to this current study were identified as being important ie education and training, use of national guidelines and considering the patient's perspective (Unnewehr et al, 2015). This current study to evaluate the quality of medication-related information in the discharge summary of elderly patients discharged from an acute hospital has identified several areas for further policy, practice and research which are identified below:

(a) There is still a need for nationally agreed and mandated standards for the quality of medication-related information at discharge to be implemented in the NHS. This study and review has highlighted that there is still poor adoption of a quality improvement approach to discharge standards for medication despite national recommendations being available. Consideration needs to be given to how to implement any national standards locally and further research needs to be carried out in this area.

(b) Hospitals should define the roles and responsibilities of staff involved with the completion and verification of a discharge summary, to ensure standards are improved and maintained of the quality of discharge summaries.

(c) GP practices should ensure there is a timely DMR of the e-discharge summary and there are defined staff responsible, trained and authorised to make changes to the GP medication records.

(d) A modified e-Delphi technique can be used to establish a consensus for a 'gold standard' discharge summary in relation to medication. This pilot study should be considered for a larger, multi-site study to validate the essential and desirable standards to inform a national standard for a 'gold standard' discharge summary in

relation to medicines that is practical to implement and compliments the recently published PRSB standards.

(e) A risk prioritisation tool for discharge summaries for elderly patients should be developed and evaluated based on the 'Q-MedDis' risk prioritisation model proposed in this study to support clinical prioritisation of discharge summaries completion to ensure that scarce resources are utilised effectively and efficiently.

(f) The specifications for the design and content of discharge summaries for either paper, electronic discharge summaries or HEPMA templates should incorporate the 'gold standards' for medication-related information as mandatory fields. The requirement to implement this should be overseen by a national body such as NHS Digital, to ensure that as a minimum, commercial suppliers of HEPMA systems include this as part of their product specifications and functionality.

(g) Hospitals should, as a minimum review their current discharge summaries templates and processes to ensure they meet the minimum requirements of the PRSB (2017).

(h) Education and training programmes for junior doctors should be targeted on how to improve the quality of a discharge summary (RCP, 2017). An educational intervention that could be carried out is to undertake a training session on "How to write a gold standard discharge summary" at induction. This could be delivered as practical prescribing exercises with reference to exemplar high-quality discharge summaries. A quality improvement method can then be used to measure the effectiveness of the intervention (Singh et al, 2015). Following the training session random samples of discharge summaries would be periodically reviewed by a senior doctor of the medical team according to the "gold standards". A scorecard of performance can be produced and used to provide feedback and training to make further improvements. There should also be greater training and awareness for hospital pharmacy staff about the need to ensure that when discharge summaries are verified at discharge that they can improve the quality of medication-related information. Consideration should be given to developing intra-professional education and training to support this as well.

(i) There is a need to undertake larger collaborative research with other hospitals and academic centres to validate a national 'gold standard' for medication-information in a discharge summary and consider the variables that may influence the level of adherence to the gold standard.

5.3 Ideas for dissemination

The results of this research study will be disseminated locally, regionally and nationally.

(a) Local measures:

(i) Present the key findings and recommendations to local key stakeholders at the hospital and county-wide Medicines Optimisation and Quality and Patient Safety committees.

(ii) Present the findings to the local HEPMA steering group to ensure that any future system designs meet the "gold standards" for an electronic discharge summary.

(b) Regional measures:

(j) Present the key findings at an East of England Chief Pharmacists Network meeting to raise awareness of the issues and to decide whether to carry out a region-wide audit of the quality of medication-related discharge information.

(ii) Present the results to the Eastern Academic Health Science Network to ensure future support for research and audits.

(c) National measures:

(i) Present a poster at a national medication safety conference of the findings to raise awareness of the issues.

(ii) Collaborate with the Chief Pharmacist of NHS Improvement to share the key findings to stimulate a national debate.

(iii) Collaborate with the research team at Newcastle University to take forward the recommendation to undertake a national e- Delphi consensus study of the quality standards of a discharge summary for medication-related information.

5.4 Future studies - what we still don't know?

The role of the patient in the completion and quality of the discharge summary has not been explored in this study but there is an emerging awareness that in some cases the patient may be a valuable resource themselves to reduce any medication-related harm. A future study should therefore be focused on gaining the patient's perspective of the content and ease of understanding of a discharge summary.

This study is essentially preliminary to a larger study as the results are not yet validated to define the gold standards and desirable standards of a discharge summary for elderly (or other) patients. There is still a need to confirm if any therapeutic classes of medicines, diseases or CCI scores influence the outcome for patients if a poor-quality discharge summary is completed.

Also, the relationship between the quality of the discharge summary content and potential for readmission requires further study with a larger sample size and follow-up 30 days after discharge and longer, such as 90 days or one-year post-discharge to establish if there is any relationship or not.

A crucial area of further study is to investigate the adoption of HEPMA systems in hospitals and adherence to the standards of a discharge summary whether used from the results of this current study or other published standards. This will be critical to measure adherence levels and any reduction of medication-related harm post-discharge that may be influenced by the design of the HEPMA discharge template.

5.5 Conclusion

There has been a significant amount published considering the extent and level of medication-related harm that can occur at transition of care for patients. Consequently, most of the implementation of strategies to reduce harm have focused on the admission part of the care pathway. However, more recently there is an awareness that more emphasis needs to be placed on reducing risk at the point of discharge and post-discharge using a DMR service.

It has been demonstrated that a modified e-Delphi technique can be employed as a method to gain consensus of the essential and desirable standards of a discharge

summary at a local level. The essential standards are best described as the gold standards and a level of 64.6% was found in this current study.

This preliminary pilot study and review has therefore demonstrated that the quality of medication-related information in a discharge summary for elderly patients is variable. The method employed in Phase I and Phase II of this study could be used to undertake a larger, multi-site and multi-ward-type study to provide a basis for an evidence-based consensus. Whilst recent national recommendations for an e-discharge summary have been made the practical implementation of these have yet to be realised and are likely to be difficult (PRSB, 2017). This current study provides a template for local implementation of the national standards and to influence the national discussion for a standardised approach to producing a gold standard discharge summary.

A larger study is also needed, as we still do not know which variables (patient, medication or service), influence the outcome of the quality of medication-related information on a discharge summary and ultimately reduce post-discharge medication discrepancies and readmission rates.

There is also still a need to develop more awareness and evidence-based processes in hospitals and GP practices for elderly patients to ensure a high-quality discharge summary is produced and accurately reconciled in the GP practice records.

5.6 Personal reflections on the current study

The interest in undertaking a Doctorate in healthcare has been partly driven by the need to be able to more critically understand how practice research can be undertaken and then be translated into real-life situations and services. I have observed that there are often significant risks to patients associated with medicines that are not always well recognised. These risks can occur at any point of a patient's pathway during their hospital stay. I have always had an interest in understanding how and why medication errors occur and the use of strategies to reduce or stop them occurring.

In undertaking this study, I have learned a lot about how to undertake a research study and the rigour, hard work and detail that is entails. Ideally this study would have been larger, across more than one site (I had originally met with the chief pharmacist of a

neighbouring hospital to act as a second site for this study). However, for pragmatic reasons I was unable to do this. Despite this, I now have more skills, confidence and knowledge of how to undertake research but also critically assess and present evidence to influence change at local and/or national level.

This preliminary study has limitations, but the principles and methods employed can be used to develop more robust research studies that could be applied more widely. There is a challenge for pharmacy practice research to not only produce good quality evidence but also influence and support change in a hospital or GP practice. One of the main reasons why we work in healthcare is to ensure we improve outcomes for our patients and reduce risk. I hope this study in some way will do this.

Appendix 1: Data collection form

Data Collection Form: Quality of Discharge Information (Medicines)

	Demographics	
1	List the following patients details from the discharge summary	(a) Patient initials (b) Date of Birth -- / -- / ---- (c) NHS Number ..... (d) Gender M ☐ F ☐ (e) Age ___ yrs
2	List the following further patient details	(a) Main Diagnosis ..... (b) Co-morbidities .... (c) Ward discharged from.....
3	Complete the following discharge details	(a) Date of admission -- / -- / ---- (b) Date of discharge -- / -- / ---- (c) Day of discharge (d) Length of stay (e) Type of admission (f) Grade of Dr writing TTA: (g) Has the patient been readmitted within 30 days? If yes is it medication related? .....
4	Details of the GP Practice	Name of GP Practice Tel No. Date GP system accessed -- / -- / ---- No of days after Discharge _____
	Essential Standards	
5	Was there a pharmacy led medicine reconciliation during admission Who validated the discharge summary Number of medicines prescribed on the TTA	Yes ☐ No ☐ Pharmacist Yes ☐ No ☐ Number: List: name and type 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

		18 19 20
6	Is the allergy status stated on the discharge summary?	Yes ☐ No ☐ If yes is a brief description of the allergy documented on the discharge summary Yes ☐ No ☐
7	How many medicines are written with the generic name	
8	How many medicines have the dose written on the discharge summary	
9	How many medicines have their route documented	
10	How many medicines have their frequency documented	
11	Are there any medicines where the duration must be specified?	Yes ☐ No ☐ How many? ..... If yes how many were specified .....
12	If the treatment is long term is this indicated on the discharge summary	Yes ☐ No ☐ How many and why

13	Is there a record of all medications that were stopped during the inpatient stay Have the GP records been updated?	Yes ☐ No ☐ NA ☐ If yes how many and specify the reason ....
14	Is there a medication where the date and the last dose is relevant	Yes ☐ No ☐ If yes please specify if any comments made ....
15	Were any medicines specified that were started during the inpatient admission?	(a) Yes ☐ No ☐ If yes how many ..... (b) Is there a reason stated for starting the medicine ..... (c) Have the new medicines been put on the GP records Yes ☐ No ☐
16	Were there any monitoring or review requirements specified on the discharge summary related to any medicines	Yes ☐ No ☐ If yes please give details ....

17	If no medicines are prescribed is this indicated?	Yes ☐ No ☐ NA ☐
18	Has there been a change in dose of any of the medication Have the GP records been updated?	Yes ☐ No ☐ If yes please give details of number and reasons
19	Were any adverse drug effects (ADE) recorded on the discharge summary	Yes ☐ No ☐ If yes please give the number and reason Was the GP records updated if there was an ADE Yes ☐ No ☐
20	Were there any details given about who to contact regarding the medication details?	Yes ☐ No ☐
	Desirable Standards	
21	How many medicines have their indications documented for use?	
22	How many medications have the strength specified on the discharge summary	

23	How many of the medications have the formulation indicated on the discharge summary	
24	Were any details specified on aids for compliance on the discharge summary?	Yes ☐ No ☐ If yes please specify
25	Was there any details of written information given to the patient	Yes ☐ No ☐ If yes please specify
26	Was there any details of advice given to the patient	Yes ☐ No ☐ If yes please specify
27	Was there any reference made to problems of adherence on the discharge summary	Yes ☐ No ☐
28	Was there any details given of other relevant contacts e.g. Community Pharmacy	Yes ☐ No ☐ If yes please specify

Appendix 2: Criteria for assessment of readmission form

Criteria for assessment of readmission due to MRI	Expert panel response
Patient admission due to medication?	Definite
	Probable
	Possible
	Doubtful
Patient suffered MRH?	Little/no confidence
	Slight/Moderate
	<50 percent confidence but a close call
	> 50 percent confidence but a close call
	Strong confidence
	Virtually certain
If MRH what was the main cause?	ADR
	Non- adherence
	Other
	Unable to determine
Preventable?	Definitely
	Possibly
	Not preventable
	Unable to evaluate
Was the readmission related to the quality of the discharge summary	Little/no confidence
	Slight/Moderate
	<50 percent confidence but a close call
	> 50 percent confidence but a close call
	Strong confidence
	Virtually certain
Severity?	Fatal
	Life threatening
	Serious
	Significant

Definition	Examples
Fatal	Patient died due to the incident
Life threatening	Patient transferred to ITU Respiratory failure requiring intubation Mental status change: patient falls and gets intracranial haemorrhage Tongue swelling/anaphylactic shock due to medication
Serious	Gastrointestinal bleed Altered mental status/excessive sedation due to medication Increased creatinine due to medication Decrease in blood pressure, patient feels lightheaded Allergic reaction: shaking, chills/fever Additional visit to clinic for treatment or additional medication
Significant	Rash Diarrhoea due to antibiotics Nausea and vomiting due to medication Any significant event that is identified by the patient but not requiring a change in therapy

Bibliography

Abdel-Qader, D.H., Harper, L., Cantrill, J.A. & Tully, M.P. 2010, "Pharmacists' interventions in prescribing errors at hospital discharge", *Drug Safety,* vol. 33, no. 11, pp. 1027-1044.

Accreditation Canada 2010*, Required Organizational Practices* (Online). Available from: https://www3.accreditation.ca/SurveyorPortal/DOCUMENTS/Resources/ROP%20Handbook%20April%202010%20EN.pdf (Accessed 13th May 2017).

Agud, M.M., Colino, R.M., Ladrero, María del Coro Mauleón, Encinar, M.R., Sebastián, J.D., Bueno, E.V., Ambrosio, A.H. & Montalvo, J.I.G. 2016, "Analysis of an electronic medication reconciliation and information at discharge programme for frail elderly patients", *International Journal of Clinical Pharmacy,* vol. 38, no. 4, pp. 996-1001.

Aljamal, M.S., Ashcroft, D. & Tully, M.P. 2016, "Development of indicators to assess the quality of medicines reconciliation at hospital admission: an e-Delphi study", *International Journal of Pharmacy Practice,* vol. 24, no. 3, pp. 209-216.

Anon, 2016, *NHS Standard Contract 2016/17: The Ipswich Hospital NHS Trust, Co-ordinating Commissioner NHS Ipswich and East Suffolk CCG*, Ipswich and East Suffolk NHS CCG.

APAC 2005, *Guiding principles to achieve continuity in medication management* (Australian Pharmaceutical Advisory Council), (Online). Available from: http://www.health.gov.au/internet/main/publishing.nsf/Content/5B47B202BBFAFE02CA257BF0001C6AAC/$File/guiding.pdf (Accessed 3rd December 2017).

Armor, B.L., Wight, A.J. & Carter, S.M. 2016, "Evaluation of Adverse Drug Events and Medication Discrepancies in Transitions of Care Between Hospital Discharge and Primary Care Follow-Up", *Journal of Pharmacy Practice,* vol. 29, no. 2, pp. 132-137.

Audit Commission 2001*, A spoonful of sugar: medicines management in NHS hospitals* (Audit Commission for Local Authorities in England and Wales, London), (Online). Available from: http://www.eprescribingtoolkit.com/wp-content/uploads/2013/11/nrspoonfulsugar1.pdf (Accessed 12th January 2018).

Avery, A., Savelyich, B., Sheikh, A., Cantrill, J., Morris, C., Fernando, B., Bainbridge, M., Horsfield, P. & Teasdale, S. 2005, "Identifying and establishing consensus on the most important safety features of GP computer systems: e-Delphi study", *Journal of Innovation in Health Informatics,* vol. 13, no. 1, pp. 3-11.

Avery, T., Barber, N., Ghaleb, M., Franklin, B.D., Armstrong, S., Crowe, S., Dhillon, S., Freyer, A., Howard, R. & Pezzolesi, C. 2012, *Investigating the prevalence and causes of prescribing errors in general practice (PRACtICe Study)*, The General Medical Council, London.

Aziz, C., Grimes, T., Deasy, E. & Roche, C. 2016, "Compliance with the Health Information and Quality Authority of Ireland National Standard for Patient Discharge Summary Information: a retrospective study in secondary care", *European Journal of Hospital Pharmacy,* vol. 23, no. 5, pp. 272-277.

Barnett, N. & Jubraj, B. 2017, "A themed journal issue on deprescribing", *European Journal of Hospital Pharmacy,* vol. 24, no. 1, pp. 1-2.

Belleli, E., Naccarella, L. & Pirotta, M. 2013, "Communication at the interface between hospitals and primary care: a general practice audit of hospital discharge summaries", *Australian Family Physician,* vol. 42, no. 12, pp. 886.

Bergkvist, A., Midlöv, P., Höglund, P., Larsson, L., Bondesson, Å. & Eriksson, T. 2009, "Improved quality in the hospital discharge summary reduces medication errors-LIMM: Landskrona Integrated Medicines Management", *European Journal of Clinical Pharmacology,* vol. 65, no. 10, pp. 1037-1046.

Blain, J. 2011, *Evaluating the quality of medicines-related information in the electronic discharge summary.*, Professional Doctorate, University of Portsmouth, Portsmouth.

BMA 2017*, Medical Training Pathway* (British Medical Association), (Online). Available from: https://www.bma.org.uk/advice/career/studying-medicine/insiders-guide-to-medical-specialties/medical-training-pathway (Accessed 19th May 2018).

BMA (Patient Liaison Group) 2014, *Hospital Discharge: the patient, carer and doctor perspective,* British Medical Association, London.

Bullock, S., Morecroft, C.W., Mullen, R. & Ewing, A.B. 2017, "Hospital patient discharge process: an evaluation", *European Journal of Hospital Pharmacy,* vol. 24, no. 5, pp. 278-282.

Cadman, B., Wright, D., Bale, A., Barton, G., Desborough, J., Hammad, E.A., Holland, R., Howe, H., Nunney, I. & Irvine, L. 2017, "Pharmacist provided medicines reconciliation within 24 hours of admission and on discharge: a randomised controlled pilot study", *BMJ open,* vol. 7, no. 3, pp. e013647-2016-013647.

Campbell, S. & Cantrill, J. 2001, "Consensus methods in prescribing research", *Journal of Clinical Pharmacy and Therapeutics,* vol. 26, no. 1, pp. 5-14.

Cantrill, J., Sibbald, B. & Buetow, S. 1996, "The Delphi and nominal group techniques in health services research", *International Journal of Pharmacy Practice,* vol. 4, no. 2, pp. 67-74.

Carter, P. 2016, *Operational productivity and performance in English NHS acute hospitals: unwarranted variations. An independent report for the Department of Health by Lord Carter of Coles*, Department of Health, London.

Chhabra, P.T., Rattinger, G.B., Dutcher, S.K., Hare, M.E., Parsons, K.L. & Zuckerman, I.H. 2012, "Medication reconciliation during the transition to and from long-term care settings: a systematic review", *Research in Social and Administrative Pharmacy,* vol. 8, no. 1, pp. 60-75.

Chu, L.W. & Pei, C.K. 1999, "Risk factors for early emergency hospital readmission in elderly medical patients", *Gerontology,* vol. 45, no. 4, pp. 220-226.

Coleman, E.A., Smith, J.D., Raha, D. & Min, S. 2005, "Post-hospital medication discrepancies: prevalence and contributing factors", *Archives of Internal Medicine,* vol. 165, no. 16, pp. 1842-1847.

Cor, M.K. & Peeters, M.J. 2015, "Using generalizability theory for reliable learning assessments in pharmacy education", *Currents in Pharmacy Teaching and Learning,* vol. 7, no. 3, pp. 332-341.

Cornish, P.L., Knowles, S.R., Marchesano, R., Tam, V., Shadowitz, S., Juurlink, D.N. & Etchells, E.E. 2005, "Unintended medication discrepancies at the time of hospital admission", *Archives of Internal Medicine,* vol. 165, no. 4, pp. 424-429.

Cornu, P., Steurbaut, S., Leysen, T., De Baere, E., Ligneel, C., Mets, T. & Dupont, A.G. 2012, "Discrepancies in medication information for the primary care physician and the geriatric patient at discharge", *Annals of Pharmacotherapy,* vol. 46, no. 7-8, pp. 983-991.

Costa, L.L. & Byon, H.D. 2018, "Post-Hospital Medication Discrepancies at Home: Risk Factor for 90-Day Return to Emergency Department", *Journal of Nursing Care Quality,* vol. 33, no. 2, pp. 180-186.

CQC 2009, *Managing patients' medicines after discharge from hospital* (Care Quality Commission), (Online). Available from: http://webarchive.nationalarchives.gov.uk/20101201001009/http:/www.cqc.org.uk/_db/_documents/Managing_patients_medicines_after_discharge_from_hospital.pdf (Accessed 14th January 2017).

Cresswell, K., Coleman, J., Smith, P., Swainson, C., Slee, A. & Sheikh, A. 2016, "Qualitative analysis of multi-disciplinary round-table discussions on the acceleration of benefits and data analytics through hospital electronic prescribing (ePrescribing) systems", *Journal of Innovation in Health Informatics,* vol. 23, no. 2, pp. 501-509.

Crombie, I., Davies, H., Abraham, S. & Florey, C. 1993, *The Audit Handbook: Improving Health Care Through Clinical Audit,* 1st edn, Wiley, Chichester.

Cua, Y.M. & Kripalani, S. 2008, "Medication use in the transition from hospital to home", *Annals of the Academy of Medicine,* vol. 37, no. 2, pp. 136.

Dalkey, N. & Helmer, O. 1963, "An experimental application of the Delphi method to the use of experts", *Management Science,* vol. 9, no. 3, pp. 458-467.

Dalleur, O., Beeler, P.E., Schnipper, J.L. & Donze, J. 2017, "30-Day Potentially Avoidable Readmissions Due to Adverse Drug Events", *Journal of Patient Safety,* (Online), Available from: www.journalpatientsafety.com, (DOI: 10.1097/PTS.0000000000000346) (Accessed 15th May 2018).

Davies, E.C., Green, C.F., Mottram, D.R., Rowe, P.H. & Pirmohamed, M. 2010, "Emergency re-admissions to hospital due to adverse drug reactions within 1 year of the index admission", *British Journal of Clinical Pharmacology,* vol. 70, no. 5, pp. 749-755.

Dean, B.S. & Barber, N.D. 1999, "A validated, reliable method of scoring the severity of medication errors", *American Journal of Health-System Pharmacy,* vol. 56, no. 1, pp. 57-62.

Department of Health 2018, *The Report of the Short Life Working group on reducing medication-related harm* (Department of Health and Social Care), (Online). Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/683430/short-life-working-group-report-on-medication-errors.pdf (Accessed 15th May 2018).

Department of Health 2010, *Ready to go? Planning the Discharge and the Transfer of Patients from Hospital and Intermediate Care*, The Stationery Office, London.

Department of Health 2003, *Discharge from hospital: pathway, process and practice*, (Online). Available from: http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4116525.pdf (Accessed 14th January 2017).

Department of Health 2001(a), *National service framework for older people*, (Online). Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/198033/National_Service_Framework_for_Older_People.pdf (Accessed 14th January 2017).

Department of Health 2001(b), *Medicines and Older People Implementing medicines-related aspects of the NSF for Older People*, (Online). Available from: http://webarchive.nationalarchives.gov.uk/20121102154227/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4067247.pdf (Accessed 10th May 2017).

Diamond, I.R., Grant, R.C., Feldman, B.M., Pencharz, P.B., Ling, S.C., Moore, A.M. & Wales, P.W. 2014, "Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies", *Journal of Clinical Epidemiology,* vol. 67, no. 4, pp. 401-409.

Dines-Allen, M. 2018, *Personal communication*, Eastern Academic Health Science Network, Telephone conversation.

Dodds, L.J. 2014, "Optimising pharmacy input to medicines reconciliation at admission to hospital: lessons from a collaborative service evaluation of pharmacy-led medicines reconciliation services in 30 acute hospitals in England", *European Journal of Hospital Pharmacy: Science and Practice,* vol. 21, no. 2, pp. 95-101.

Donabedian, A. 1981, "Criteria, norms and standards of quality: what do they mean?", *American Journal of Public Health,* vol. 71, no. 4, pp. 409-412.

Dornan, T., Ashcroft, D., Heathfield, H., Lewis, P., Miles, J., Taylor, D., Tully, M. & Wass, V. 2009, *An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study* (General Medical Council), (Online). Available from: http://www.badmed.net/docs/Final_Report.pdf (Accessed 15th May 2018).

Duffield, C. 1993, "The Delphi technique: a comparison of results obtained using two expert panels", *International Journal of Nursing Studies,* vol. 30, no. 3, pp. 227-237.

Duffin, J., Norwood, J. & Blenkinsopp, A. 1998, "An investigation into medication changes initiated in general practice after patients are discharged from hospital", *Pharmaceutical Journal,* vol. 261, pp. R32-R32.

Duggan, C., Bates, I. & Hough, J. 1996, "Discrepancies in prescribing-where do they occur?", *Pharmaceutical Journal,* vol. 256, no. 6887, pp. 65-67.

Eassey, D., McLachlan, A.J., Brien, J., Krass, I. & Smith, L. 2017, ""I have nine specialists. They need to swap notes!" Australian patients' perspectives of medication-related problems following discharge from hospital", *Health Expectations,* vol. 20, no. 5, pp. 1114-1120.

Eassey, D., Smith, L., Krass, I., McLachlan, A. & Brien, J. 2016, "Consumer perspectives of medication-related problems following discharge from hospital in Australia: a quantitative study", *International Journal for Quality in Health Care,* vol. 28, no. 3, pp. 391-397.

ELHT 2018*, Refer to Pharmacy* (East Lancashire Hospitals NHS Trust), (Online). Available from: https://www.elht.nhs.uk/services/refer (Accessed 2nd June 2018).

Ellis, R. & Whittington, D. 1993, *Quality Assurance in Health Care: A Handbook,* 1st edn., Edward Arnold, London.

e-prescribing toolkit 2007*, e Prescribing functional specifications for NHS Trusts* (e-prescribing toolkit), (Online). Available from: http://webarchive.nationalarchives.gov.uk/20130503111350/http://www.connectingforhealth.nhs.uk/systemsandservices/eprescribing/baselinefunctspec.pdf (Accessed 16th January 2017).

EU 2011, "Council Directive 2011/24/EU of 9 March 2011 on the application of patients' rights in cross-border healthcare", *Official Journal of the European Union,* (Online), vol. L88. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0045:0065:EN:PDF. (Accessed 14th January 2017).

Falconer, N., Liow, D., Zeng, I., Parsotam, N., Seddon, M. & Nand, S. 2017, "Validation of the assessment of risk tool: patient prioritisation technology for clinical pharmacist interventions", *European Journal of Hospital Pharmacy-Science and Practice,* vol. 24, no. 6, pp. 320-326.

Falconer, N., Barras, M. & Cottrell, N. 2018, "Systematic review of predictive risk models for adverse drug events in hospitalized patients", *British Journal of Clinical Pharmacology,* vol. 84, no. 5, pp. 846-864.

Fitch, S., Cheah, M., Arlachova,K & Weerasuiya, N. 2017, "What does a GP really want in a transfer of care document for hip fracture patients?", *GMJournal,* (Online) vol. 47, no. 12. Available from: https://www.gmjournal.co.uk/what-does-a-gp-really-want-in-a-transfer-of-care-document-for-hip-fracture-patients. (Accessed 27th May 2018).

Forster, A.J., Murff, H.J., Peterson, J.F., Gandhi, T.K. & Bates, D.W. 2003, "The incidence and severity of adverse events affecting patients after discharge from the hospital", *Annals of Internal Medicine,* vol. 138, no. 3, pp. 161-167.

Forster, A.J., Clark, H.D., Menard, A., Dupuis, N., Chernish, R., Chandok, N., Khan, A. & van Walraven, C. 2004, "Adverse events among medical patients after discharge from hospital", *Canadian Medical Association journal,* vol. 170, no. 3, pp. 345-349.

Garcia, B.H., Djønne, B.S., Skjold, F., Mellingen, E.M. & Aag, T.I. 2017, "Quality of medication information in discharge summaries from hospitals: an audit of electronic patient records", *International Journal of Clinical Pharmacy,* vol. 39, no. 6, pp. 1331-1337.

Garfield, S., Jheeta, S., Husson, F., Lloyd, J., Taylor, A., Boucher, C., Jacklin, A., Bischler, A., Norton, C. & Hayles, R. 2016, "The role of hospital inpatients in supporting medication safety: a qualitative study", *PloS ONE,* vol. 11, no. 4, pp. e0153721.

George, J., Phun, Y., Bailey, M.J., Kong, D.C. & Stewart, K. 2004, "Development and validation of the medication regimen complexity index", *Annals of Pharmacotherapy,* vol. 38, no. 9, pp. 1369-1376.

Gilbert, A.V., Patel, B.K., Roberts, M.S., Williams, D.B., Crofton, J.H., Morris, N.M., Wallace, J. & Gilbert, A.L. 2017, "An audit of medicines information quality in electronically generated discharge summaries-evidence to meet the Australian National Safety and Quality Health Service Standards", *Journal of Pharmacy Practice and Research,* vol. 47, no. 5, pp. 355-364.

Gill, F.J., Leslie, G.D., Grech, C. & Latour, J.M. 2013, "Using a web-based survey tool to undertake a Delphi study: application for nurse education research", *Nurse Education Today,* vol. 33, no. 11, pp. 1322-1328.

Gillis, A. & MacDonald, B. 2005, "Deconditioning in the hospitalized elderly", *The Canadian Nurse,* vol. 101, no. 6, pp. 16-20.

Gleason, K.M., Groszek, J.M., Sullivan, C., Rooney, D., Barnard, C. & Noskin, G.A. 2004, "Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients", *American Journal of Health System Pharmacy,* vol. 61, no. 16, pp. 1689-1694.

Gonçalves-Bradley, D.C., Lannin, N.A., Clemson, L.M., Cameron, I.D. & Shepperd, S. 2016, *Discharge planning from hospital (review)* (Cochranelibrary-Wiley), (Online). Available from: http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD000313.pub5/epdf (Accessed 15th May 2018).

Goodman, C.M. 1987, "The Delphi technique: a critique", *Journal of Advanced Nursing,* vol. 12, no. 6, pp. 729-734.

Green, B., Jones, M., Hughes, D. & Williams, A. 1999, "Applying the Delphi technique in a study of GPs' information requirements", *Health & Social Care in the Community,* vol. 7, no. 3, pp. 198-205.

Greenwald, J.L., Halasyamani, L.K., Greene, J., LaCivita, C., Stucky, E., Benjamin, B., Reid, W., Griffin, F.A., Vaida, A.J. & Williams, M.V. 2010, "Making inpatient medication reconciliation patient centered, clinically relevant, and implementable: a consensus statement on key principles and necessary first steps", *Joint Commission Journal on Quality and Patient Safety,* vol. 36, no. 11, pp. 504-513.

Griffiths, C., Foster, G., Ramsay, J., Eldridge, S. & Taylor, S. 2007, "How effective are expert patient (lay led) education programmes for chronic disease?", *BMJ,* vol. 334, no. 7606, pp. 1254-1256.

Grimes, T.C., Duggan, C.A., Delaney, T.P., Graham, I.M., Conlon, K.C., Deasy, E., Jago-Byrne, M. & O'Brien, P. 2011, "Medication details documented on hospital discharge: cross-sectional observational study of factors associated with medication non-reconciliation", *British Journal of Clinical Pharmacology,* vol. 71, no. 3, pp. 449-457.

Grimshaw, J. & Russell, I. 1993, "Achieving health gain through clinical guidelines. I: Developing scientifically valid guidelines", *Quality in Health Care: QHC,* vol. 2, no. 4, pp. 243-248.

Gross, Z. 2001, "News feature - How pharmacists help speed up the discharge process to release beds", *Pharmaceutical Journal,* vol. 267, no. 7173, pp. 673-674.

Halasyamani, L., Kripalani, S., Coleman, E., Schnipper, J., Van Walraven, C., Nagamine, J., Torcson, P., Bookwalter, T., Budnitz, T. & Manning, D. 2006, "Transition of care for hospitalized elderly patients- development of a discharge checklist for hospitalists", *Journal of Hospital Medicine,* vol. 1, no. 6, pp. 354-360.

Hall, W.H., Ramachandran, R., Narayan, S., Jani, A.B. & Vijayakumar, S. 2004, "An electronic application for rapidly calculating Charlson comorbidity score", *BMC Cancer,* vol. 4, no. 1, pp. 94.

Hallas, J., Harvald, B., Gram, L., Grodum, E., Brøsen, K., Haghfelt, T. & Damsbo, N. 1990, "Drug related hospital admissions: the role of definitions and intensity of data collection, and the possibility of prevention", *Journal of Internal Medicine,* vol. 228, no. 2, pp. 83-90.

Hammad, E.A., Wright, D.J., Walton, C., Nunney, I. & Bhattacharya, D. 2014, "Adherence to UK national guidance for discharge information: an audit in primary care", *British Journal of Clinical Pharmacology,* vol. 78, no. 6, pp. 1453-1464.

Hansen, L.O., Strater, A., Smith, L., Lee, J., Press, R., Ward, N., Weigelt, J.A., Boling, P. & Williams, M.V. 2011, "Hospital discharge documentation and risk of rehospitalisation", *BMJ Quality & Safety,* vol. 20, no. 9, pp. 773-778.

Hartwig, S.C., Denger, S.D. & Schneider, P.J. 1991, "Severity-indexed, incident report-based medication error-reporting program", *American Journal of Hospital Pharmacy,* vol. 48, no. 12, pp. 2611-2616.

Hasson, F., Keeney, S. & McKenna, H. 2000, "Research guidelines for the Delphi survey technique", *Journal of Advanced Nursing,* vol. 32, no. 4, pp. 1008-1015.

Hasson, F., & Keeney, S. 2011, "Enhancing rigour in the Delphi technique research", *Technological Forecasting and Social Change,* vol. 78, no. 9, pp. 1695-1704.

Healthwatch England 2015*, Safely home: what happens when people leave hospital and care settings?* (Online). Available from: http://www.healthwatch.co.uk/sites/healthwatch.co.uk/files/final_report_healthwatch_special_inquiry_2015_1.pdf (Accessed 16th January 2017).

Hesselink, G., Schoonhoven, L., Plas, M., Wollersheim, H. & Vernooij-Dassen, M. 2013, "Quality and safety of hospital discharge: a study on experiences and perceptions of patients, relatives and care providers", *International Journal for Quality in Health Care,* vol. 25, no. 1, pp. 66-74.

HIQA 2013*, National Standard for Patient Discharge Summary Information* (Health Information and Quality Authority), (Online). Available from: https://www.hiqa.ie/sites/default/files/2017-01/National-Standard-Patient-Discharge-Summary.pdf (Accessed 16th January 2017).

Hohmann, C., Neumann-Haefelin, T., Klotz, J., Freidank, A. & Radziwill, R. 2014, "Providing systematic detailed information on medication upon hospital discharge as an important step towards improved transitional care", *Journal of Clinical Pharmacy and Therapeutics,* vol. 39, no. 3, pp. 286-291.

Holdhus, H., Bøvre, K., Mathiesen, L., Bjelke, B. & Bjerknes, K. 2018, "Limited effect of structured medication report as the only intervention at discharge from hospital (Epub ahead of print 15th May 2018, doi:10.1136/ ejhpharm-2017-001371.), *European Journal of Hospital Pharmacy,* (Online). Available from: http://ejhp.bmj.com/content/ejhpharm/early/2018/04/29/ejhpharm-2017-001371.full.pdf (Accessed 15th May 2018).

House of Commons 2016, *House of Commons Public Administration and Constitutional Affairs Committee Follow-up to PHSO report on unsafe discharge from hospital Fifth Report of Session 2016-17,* (Online). Available from: https://publications.parliament.uk/pa/cm201617/cmselect/cmpubadm/97/97.pdf (Accessed 16th January 2017).

HSCIC 2013*, Standards for the clinical structure and content of patient medical records* (Royal College of Physicians), (Online). Available from: https://www.rcplondon.ac.uk/projects/outputs/standards-clinical-structure-and-content-patient-records (Accessed 17th January 2017).

Hsu, C. & Sandford, B.A. 2007, "The Delphi technique: making sense of consensus", *Practical Assessment, Research & Evaluation,* vol. 12, no. 10, pp. 1-8.

IHI 2017, *Medicines Reconciliation to prevent Adverse Drug Events* (Institute for Healthcare Improvement), (Online). Available from: http://www.ihi.org/Topics/ADEsMedicationReconciliation/Pages/default.aspx (Accessed 12th May 2017).

Jani, Y., Shah, C. & Hough, J. 2017, "Medicines Reconciliation in Primary Care following hospitalisation (ISQUA17-3144)", *International Journal for Quality in Health Care,* vol. 29, no. suppl_1, pp. 39-40.

Jencks, S.F., Williams, M.V. & Coleman, E.A. 2009, "Rehospitalizations among patients in the Medicare fee-for-service program", *New England Journal of Medicine,* vol. 360, no. 14, pp. 1418-1428.

Jha, A.K., Orav, E.J. & Epstein, A.M. 2009, "Public reporting of discharge planning and rates of readmissions", *New England Journal of Medicine,* vol. 361, no. 27, pp. 2637-2645.

Jones, J. & Hunter, D. 1995, "Consensus methods for medical and health services research", *BMJ,* vol. 311, no. 7001, pp. 376-380.

Keeney, S., Hasson, F. & McKenna, H.P. 2001, "A critical review of the Delphi technique as a research methodology for nursing", *International Journal of Nursing Studies,* vol. 38, no. 2, pp. 195-200.

Keeney, S., Hasson, F. & McKenna, H. 2006, "Consulting the oracle: ten lessons from using the Delphi technique in nursing research", *Journal of Advanced Nursing,* vol. 53, no. 2, pp. 205-212.

Keers, R., Williams, S., Vattakatuchery, J., Brown, P., Miller, J., Prescott, L. & Ashcroft, D. 2015, "Medication safety at the interface: evaluating risks associated with discharge prescriptions from mental health hospitals", *Journal of Clinical Pharmacy and Therapeutics,* vol. 40, no. 6, pp. 645-654.

Kings Fund. 2015, *The number of hospital beds*, (Online). Available from: https://www.kingsfund.org.uk/projects/nhs-in-a-nutshell/hospital-beds (Accessed 14th January 2017).

Knai, C., Footman, K., Glonti, K. & Warren, E. 2013, "The role of discharge summaries in improving continuity of care across borders", *Eurohealth Observer,* vol. 19, no. 4, pp. 10-12.

Knight, D.A., Thompson, D., Mathie, E. & Dickinson, A. 2013, "'Seamless care? Just a list would have helped! "Older people and their carer's experiences of support with medication on discharge home from hospital", *Health Expectations,* vol. 16, no. 3, pp. 277-291.

Kongkaew, C., Hann, M., Mandal, J., Williams, S.D., Metcalfe, D., Noyce, P.R. & Ashcroft, D.M. 2013, "Risk factors for hospital admissions associated with adverse drug events", *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy,* vol. 33, no. 8, pp. 827-837.

Kripalani, S., Jackson, A.T., Schnipper, J.L. & Coleman, E.A. 2007a, "Promoting effective transitions of care at hospital discharge: a review of key issues for hospitalists", *Journal of Hospital Medicine,* vol. 2, no. 5, pp. 314-323.

Kripalani, S., LeFevre, F., Phillips, C.O., Williams, M.V., Basaviah, P. & Baker, D.W. 2007b, "Deficits in communication and information transfer between hospital-based and primary care physicians: implications for patient safety and continuity of care", *JAMA,* vol. 297, no. 8, pp. 831-841.

Kripalani, S. 2016, "Clinical summaries for hospitalised patients: time for higher standards", *BMJ Quality & Safety,* vol. 26, no. 5, pp. 354-356.

Kwan, J.L., Lo, L., Sampson, M. & Shojania, K.G. 2013, "Medication Reconciliation During Transitions of Care as a Patient Safety Strategy: A Systematic Review", *Annals of Internal Medicine,* vol. 158, no. 5_Part_2, pp. 397-403.

Langelaan, M., Baines, R.J., de Bruijne, M.C. & Wagner, C. 2017, "Association of admission and patient characteristics with quality of discharge letters: posthoc analysis of a retrospective study", *BMC Health Services Research,* vol. 17, no. 1, pp. 225.

Legault, K., Ostro, J., Khalid, Z., Wasi, P. & You, J.J. 2012, "Quality of discharge summaries prepared by first year internal medicine residents", *BMC Medical Education,* vol. 12, no. 1, pp. 77.

Lehnbom, E.C., Raban, M.Z., Walter, S.R., Richardson, K. & Westbrook, J.I. 2014, "Do electronic discharge summaries contain more complete medication information? A retrospective analysis of paper versus electronic discharge summaries", *Health Information Management Journal,* vol. 43, no. 3, pp. 4-12.

MacAulay, E.M., Cooper, G.G., Engeset, J. & Naylor, A.R. 1996, "Prospective audit of discharge summary errors", *British Journal of Surgery,* vol. 83, no. 6, pp. 788-790.

Mackridge, A.J., Rodgers, R., Lee, D., Morecroft, C.W. & Krska, J. 2017, "Cross-sectional survey of patients' need for information and support with medicines after discharge from hospital", *International Journal of Pharmacy Practice,* (Online), Available from: https://onlinelibrary.wiley.com/doi/epdf/10.1111/ijpp.12411 (Accessed 15th May 2018).

Mahfouz, C., Bonney, A., Mullan, J. & Rich, W. 2017, "An Australian discharge summary quality assessment tool: A pilot study", *Australian Family Physician,* vol. 46, no. 1, pp. 57-63.

Marinker, M. & Shaw, J. 2003, "Not to be taken as directed", *BMJ,* vol. 326, no. 7385, pp. 348-349.

Marks, L. 1994, *Seamless Care Or Patchwork Quilt? : Discharging Patients from Acute Hospital Care (Research Report),* 1st edn., King's Fund Institute, London.

Maurice, A.P., Chan, S., Pollard, C.W., Kidd, R.A., Ayre, S.J., Ward, H.E. & Walters, D.L. 2014, "Improving the quality of hospital discharge summaries utilising an electronic prompting system", *BMJ Open Quality,* vol. 3, no. 1, pp. u200548. w2201.

May-Miller, H., Hayter, J., Loewenthal, L., Hall, L., Hilbert, R., Quinn, M., Pearson, N., Patel, A. & Law, R. 2015, "Improving the quality of discharge summaries: implementing updated Academy of Medical Royal Colleges standards at a district general hospital", *BMJ Open Quality,* vol. 4, no. 1, pp. u207268. w2918.

McIlrath, C., Keeney, S., McKenna, H. & McLaughlin, D. 2010, "Benchmarks for effective primary care-based nursing services for adults with depression: a Delphi study", *Journal of Advanced Nursing,* vol. 66, no. 2, pp. 269-281.

McKenna, H.P. 1994, "The Delphi technique: a worthwhile research approach for nursing?", *Journal of Advanced Nursing,* vol. 19, no. 6, pp. 1221-1225.

McKenna, H., Hasson, F. & Smith, M. 2002, "A delphi survey of midwives and midwifery students to identify non-midwifery duties", *Midwifery,* vol. 18, no. 4, pp. 314-322.

McMillan, T., Allan, W. & Black, P. 2006, "Accuracy of information on medicines in hospital discharge summaries", *Internal Medicine Journal,* vol. 36, no. 4, pp. 221-225.

Michaelsen, M.H., McCague, P., Bradley, C.P. & Sahm, L.J. 2015, "Medication reconciliation at discharge from hospital: a systematic review of the quantitative literature", *Pharmacy,* vol. 3, no. 2, pp. 53-71.

Michaelson, M., Walsh, E., Bradley, C., McCague, P., Owens, R. & Sahm, L. 2017, "Prescribing error at hospital discharge: a retrospective review of medication information in an Irish hospital", *Irish Journal of Medical Science,* vol. 186, no. 3, pp. 795-800.

Midlöv, P., Holmdahl, L., Eriksson, T., Bergkvist, A., Ljungberg, B., Widner, H., Nerbrand, C. & Höglund, P. 2008, "Medication report reduces number of medication errors when elderly patients are discharged from hospital", *Pharmacy World & Science,* vol. 30, no. 1, pp. 92-98.

Miller, E., McElnay, J., Scott, M. & McConnell, J. 2000, "The development and validation of a hospital readmissions predictive model", *Pharmaceutical Journal,* vol. 265, no. 7114, pp. R55.

Mills, P.R., Weidmann, A.E. & Stewart, D. 2016, "Hospital discharge information communication and prescribing errors: a narrative literature overview", *European Journal of Hospital Pharmacy,* vol. 23, no. 1, pp. 3-10.

Mills, P.R., Weidmann, A.E. & Stewart, D. 2017a, "Hospital staff views of prescribing and discharge communication before and after electronic prescribing system implementation", *International Journal of Clinical Pharmacy,* vol. 39, no. 6, pp. 1320-1330.

Mills, P.R., Weidmann, A.E. & Stewart, D. 2017b, "Hospital electronic prescribing system implementation impact on discharge information communication and prescribing errors: a before and after study", *European Journal of Clinical Pharmacology,* vol. 73, no. 10, pp. 1279-1286.

Morimoto, T., Gandhi, T.K., Seger, A.C., Hsieh, T.C. & Bates, D.W. 2004, "Adverse drug events and medication errors: detection and classification methods", *Quality & Safety in Health Care,* vol. 13, no. 4, pp. 306-314.

Mozaffar, H., Williams, R., Cresswell, K., Morison, Z., Slee, A. & Team, A.S. 2014, "Product diversity and spectrum of choice in hospital ePrescribing systems in England", *PloS ONE,* vol. 9, no. 4, pp. e92516.

Mozaffar, H., Cresswell, K.M., Williams, R., Bates, D.W. & Sheikh, A. 2017, "Exploring the roots of unintended safety threats associated with the introduction of hospital ePrescribing systems and candidate avoidance and/or mitigation strategies: a qualitative study", *BMJ Quality & Safety,* vol. 26, no. 9, pp. 722-733.

Murphy, S., Lenihan, L., Orefuwa, F., Colohan, G., Hynes, I. & Collins, C. 2017, "Electronic discharge summary and prescription: improving communication between hospital and primary care", *Irish Journal of Medical Science,* vol. 186, no. 2, pp. 455-459.

NAO 2016, *Discharging older patients from hospital* (National Audit Office), (Online). Available from: https://www.nao.org.uk/report/discharging-older-patients-from-hospital/ (Accessed 15th January 2017).

Naranjo, C.A., Busto, U., Sellers, E.M., Sandor, P., Ruiz, I., Roberts, E.A., Janecek, E., Domecq, C. & Greenblatt, D.J. 1981, "A method for estimating the probability of adverse drug reactions", *Clinical Pharmacology and Therapeutics,* vol. 30, no. 2, pp. 239-245.

Nazar, H. 2018, *Personal communication*, Newcastle University, email.

Nazar, H., Nazar, Z., Portlock, J., Todd, A. & Slight, S.P. 2015, "A systematic review of the role of community pharmacies in improving the transition from secondary to primary care", *British Journal of Clinical Pharmacology,* vol. 80, no. 5, pp. 936-948.

Nazar, H., Brice, S., Akhter, N., Kasim, A., Gunning, A., Slight, S.P. & Watson, N.W. 2016, "New transfer of care initiative of electronic referral from hospital to community pharmacy in England: a formative service evaluation", *BMJ Open,* vol. 6, no. 10, pp. e012532-2016-012532.

NHS Alliance 2007, *A very present danger: a national survey into information provided by hospital to GPs when patients are discharged*, NHS Alliance, London.

NHS Benchmarking 2017*, Pharmacy and Medicines Optimisation* (East London NHS Foundation Trust), (Online). Available from: https://www.nhsbenchmarking.nhs.uk/projects/pharmacy-and-medicines-optimisation-provider-project (Accessed 3rd June 2018).

NHS Digital 2016, *Hospital Admitted Patient Care Activity 2015-16*, (Online). Available from: http://www.content.digital.nhs.uk/catalogue/PUB22378/hosp-epis-stat-admi-summ-rep-2015-16-rep.pdf (Accessed 14th January 2017).

NHS England 2017, *NHS Standard Contract 2017/18 and 2018/19 Service Conditions*, (Online). Available from: https://www.england.nhs.uk/publication/nhs-standard-contract-2017-18-and-2018-19-service-conditions-full-length/ (Accessed 26th February 2017).

NHS England 2014, *Patient Safety Alert Stage One: Warning, Risks arising from breakdown and failure to act on communication during handover at the time of discharge from secondary care (NHS/PSA/W/2014/014)*, (Online). Available from: https://www.england.nhs.uk/wp-content/uploads/2014/08/psa-imp-saf-of-discharge.pdf (Accessed 14th January 2017).

NHS Improvement 2018*, Model Hospital*, (Online). Available from: https://improvement.nhs.uk/resources/model-hospital/ (Accessed 3rd June 2018).

NICE 2017*, Multimorbidity and polypharmacy. Key therapeutic topic (KTT) 118*. Available from: https://www.nice.org.uk/advice/ktt18 (Accessed 20th February 2017).

NICE 2015a, *Transition between inpatient hospital settings and community or care home settings for adults with social care needs (NICE guideline 27)*, (Online). Available from: https://www.nice.org.uk/guidance/ng27/resources/transition-between-inpatient-hospital-settings-and-community-or-care-home-settings-for-adults-with-social-care-needs-1837336935877 (Accessed 16th January 2017).

NICE 2015b*, Medicines Optimisation: the safe and effective use of medicines to enable the best possible outcomes, (*Online). Available from: https://www.nice.org.uk/guidance/ng5/resources/medicines-optimisation-the-safe-and-effective-use-of-medicines-to-enable-the-best-possible-outcomes-51041805253 (Accessed 16th January 2017).

NICE 2015c, *Costing statement: Medicines Optimisation. Implementing the NICE guideline on medicines optimisation (NICE Guideline 5).* (Online). Available from: https://www.nice.org.uk/guidance/ng5/resources/costing-statement-pdf-6916717 (Accessed 10th May 2018).

NICE 2014*, Drug allergy: diagnosis and management (Clinical Guideline 183)*, (Online). Available from: https://www.nice.org.uk/guidance/cg183 (Accessed 21st May 2017).

NICE 2009*, Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence (Clinical Guideline 76)*, (Online). Available from: https://www.nice.org.uk/guidance/cg76 (Accessed 16th January 2017).

NICE 2007, *Technical patient safety solutions for medicines reconciliation on admission of adults to hospital (NPSA/2007/PSG001)*, (Online). Available from: https://www.sps.nhs.uk/wp-content/uploads/2017/07/Meds-RecTechnical-patient-safety-solutions-2007.pdf (Accessed 12th February 2018).

Nivya, K., Kiran, V.S.S., Ragoo, N., Jayaprakash, B. & Sekhar, M.S. 2015, "Systemic review on drug related hospital admissions–A Pubmed based search", *Saudi Pharmaceutical Journal,* vol. 23, no. 1, pp. 1-8.

NPC 2015*, Medicines Reconciliation Flow Chart: Patient Discharge from Secondary Care to Primary Care* (National Prescribing Centre), (Online). Available from: https://www.sps.nhs.uk/wp-content/uploads/2017/07/NPC-Process-of-Meds-Rec_May-15.pdf (Accessed 10th May 2018).

NPSA 2008, *A risk matrix for risk managers*, (National Patient Safety Agency), (Online). Available from: http://webarchive.nationalarchives.gov.uk/20171030135716/http://www.nrls.npsa.nhs.uk/resources/search-by-audience/clinical-risk-managers/?entryid45=59833&p=8 (Accessed 5th March 2017).

Nunes, V., Neilson, J., O'flynn, N., Calvert, N., Kuntze, S., Smithson, H., Benson, J., Blair, J., Bowser, A. & Clyne, W. 2009, *Clinical guidelines and evidence review for medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence*, National Collaborating Centre for Primary Care and Royal College of General Practitioners, London.

O'Riordan, C., Delaney, T. & Grimes, T. 2016, "Exploring discharge prescribing errors and their propagation post-discharge: an observational study", *International Journal of Clinical Pharmacy,* vol. 38, no. 5, pp. 1172-1181.

Oboh, L. 2016, "Communication during transfer of care of older people", *Pharmaceutical Journal,* vol. 296, no. 7889, pp. 300-303.

Onatade, R., Sawieres, S., Veck, A., Smith, L., Gore, S. & Al-Azeib, S. 2017, "The incidence and severity of errors in pharmacist-written discharge medication orders", *International Journal of Clinical Pharmacy,* vol. 39, no. 4, pp. 722-728.

Onder, G., Petrovic, M., Tangiisuran, B., Meinardi, M.C., Markito-Notenboom, W.P., Somers, A., Rajkumar, C., Bernabei, R. & van der Cammen, Tischa JM 2010, "Development and validation of a score to assess risk of adverse drug reactions among in-hospital patients 65 years or older: the GerontoNet ADR risk score", *Archives of Internal Medicine,* vol. 170, no. 13, pp. 1142-1148.

Petrie, J.C., Grimshaw, J.M. & Bryson, A. 1995, "The Scottish Intercollegiate Guidelines Network Initiative: getting validated guidelines into local practice", *Health Bulletin,* vol. 53, no. 6, pp. 345-348.

Pherson, E.C., Shermock, K.M., Efird, L.E., Gilmore, V.T., Nesbit, T., LeBlanc, Y., Brotman, D.J., Deutschendorf, A. & Swarthout, M.D. 2014, "Development and implementation of a post discharge home-based medication management service", *American Journal of Health-System Pharmacy,* vol. 71, no. 18, pp. 1576-1583.

PHP 2018, *PharmOutcomes* ,(Pinnacle Health Partnership LLP), (Online). Available from: https://phpartnership.com/home (Accessed 2nd June 2018).

Picton, C. & Wright, H. 2012, *Keeping patients safe when they transfer between care providers: getting the medicines right*, Royal Pharmaceutical Society, London.

Pirmohamed, M., James, S., Meakin, S., Green, C., Scott, A.K., Walley, T.J., Farrar, K., Park, B.K. & Breckenridge, A.M. 2004, "Adverse drug reactions as cause of admission to hospital: prospective analysis of 18, 820 patients", *BMJ,* vol. 329, no. 7456, pp. 15-19.

Powell, C. 2003, "The Delphi technique: myths and realities", *Journal of Advanced Nursing,* vol. 41, no. 4, pp. 376-382.

Preen, D.B., Bailey, B.E., Wright, A., Kendall, P., Phillips, M., Hung, J., Hendriks, R., Mather, A. & Williams, E. 2005, "Effects of a multidisciplinary, post-discharge continuance of care intervention on quality of life, discharge satisfaction, and hospital length of stay: a randomized controlled trial", *International Journal for Quality in Health Care,* vol. 17, no. 1, pp. 43-51.

PRSB 2017*, e-Discharge summary*, (Professional Records Standards Body), (Online). Available from: https://theprsb.org/standards/edischargesummary/ (Accessed 3rd June 2018).

Rademaker, M., 2001. Do women have more adverse drug reactions?, *American journal of clinical dermatology*, *2*(6), pp.349-35

Ramsbottom, H., Rutter, P. & Fitzpatrick, R. 2018, "Post discharge medicines use review (dMUR) service for older patients: Cost-savings from community pharmacist interventions", *Research in Social and Administrative Pharmacy,* vol. 14, no. 2, pp. 203-206.

Rawlins, M. 1999, "In pursuit of quality: the National Institute for Clinical Excellence", *The Lancet,* vol. 353, no. 9158, pp. 1079-1082.

RCP 2017*, Supporting junior doctors in safe prescribing*,(Royal College of Physicians), (Online). Available from: https://www.rcplondon.ac.uk/projects/outputs/supporting-junior-doctors-safe-prescribing (Accessed 15th May 2018).

Reason, J. 2000, "Human error: models and management", *BMJ,* vol. 320, no. 7237, pp. 768-770.

Ridge, K., Jenkins, D., Noyce, P. & Barber, N. 1995, "Medication errors during hospital drug rounds.", *BMJ Quality & Safety,* vol. 4, no. 4, pp. 240-243.

RPS 2012*, Keeping patients safe when they transfer between care providers-getting the medicines right* (Royal Pharmaceutical Society), (Online). Available from: https://www.rpharms.com/Portals/0/RPS%20document%20library/Open%20access/Publications/Keeping%20patients%20safe%20transfer%20of%20care%20report.pdf (Accessed 16th January 2017).

RPS 2005*, Moving Patients Safely: Guidance on Discharge and Transfer planning*, (Royal Pharmaceutical Society), (Online). Available from: https://psnc.org.uk/wp-content/uploads/2013/07/Moving20Medicines20new1.pdf (Accessed 16th January 2017).

Ryan, C., Ross, S., Davey, P., Duncan, E.M., Francis, J.J., Fielding, S., Johnston, M., Ker, J., Lee, A.J. & MacLeod, M.J. 2014, "Prevalence and causes of prescribing errors: the Prescribing Outcomes for Trainee doctors Engaged in Clinical Training (PROTECT) study", *PloS ONE,* vol. 9, no. 1, pp. e79802.

SA Health 2013, *Electronic Discharge Summaries Directive*, (South Australia Health), (Online). Available from: http://www.sahealth.sa.gov.au/wps/wcm/connect/6fabf88040776d359488be222b2948cf/Directive_Electronic_Discharge_Summaries_Jul2013.pdf?MOD=AJPERES&CACHEID=6fabf88040776d359488be222b2948cf&CACHE=NONE (Accessed 16th January 2017).

Sackett, D., Rosenberg, W., Gray, J., Haynes, R. & Richardson, W. 1996, "Evidence based medicine: what it is and what it isn't.", *BMJ,* vol. 312, no. 7023, pp. 71-72.

Sakowski, J., Newman, J.M. & Dozier, K. 2008, "Severity of medication administration errors detected by a bar-code medication administration system", *American Journal of Health-System Pharmacy,* vol. 65, no. 17, pp. 1661-1666.

Sarzynski, E., Hashmi, H., Subramanian, J., Fitzpatrick, L., Polverento, M., Simmons, M., Brooks, K. & Given, C. 2017, "Opportunities to improve clinical summaries for patients at hospital discharge", *BMJ Quality & Safety,* vol. 26, no. 5, pp. 372-380.

Scholes, S., Faulding, S. & Mindell, J. 2013, *Use of prescribed medicines- chapter 5- NHS Health Survey for England-2013*, Health & Social Care Information Centre, London.

Sentinel Event Alert 2006, "Using medication reconciliation to prevent errors", *Journal on Quality and Patient Safety [serial online],* vol. 32, no. 4, pp. 230-232.

Shah, C., Lehman, H. & Richardson, S. 2014, "Medicines optimisation: an agenda for community nursing", *Journal of Community Nursing,* vol. 28, no. 3, pp. 82-85.

Shah, C, Hough, J and Jani, Y 2016*, Collaborative audit across England on the quality of medication related information provided when transferring patients from secondary care to primary care and the subsequent medicines reconciliation in primary care*, (Specialist Pharmacy Services), (Online). Available from: https://www.sps.nhs.uk/articles/a-collaborative-audit-on-the-quality-of-medication-related-information-provided-when-transferring-patients-from-secondary-care-to-primary-care-and-the-subsequent-medicines-reconciliation-in-primary- (Accessed 17th January 2017).

Shavelson, R.J., Webb, N.M. & Rowley, G.L. 1989, "Generalizability theory.", *American Psychologist,* vol. 44, no. 6, pp. 922.

Shaw, C.D. 2015, "How can healthcare standards be standardised?", *BMJ Quality & Safety,* vol. 24, no. 10, pp. 615-619.

Shaw, C.D. & Costain, D.W. 1989, "Guidelines for medical audit: seven principles", *BMJ,* vol. 299, no. 6697, pp. 498-499.

SIGN 2012, *The SIGN discharge document. (SIGN publication no. 128)* (Scottish Intercollegiate Guidelines Network), (Online). Available from: http://www.sign.ac.uk/assets/sign128.pdf (Accessed 14th January 2017).

Singh, G., Harvey, R., Dyne, A., Said, A. & Scott, I. 2015, "Hospital discharge summary scorecard: a quality improvement tool used in a tertiary hospital general medicine service", *Internal Medicine Journal,* vol. 45, no. 12, pp. 1302-1305.

Skulmoski, G.J., Hartman, F.T. & Krahn, J. 2007, "The Delphi method for graduate research", *Journal of Information Technology Education: Research,* vol. 6, pp. 1-21.

Slee, A. 2014, *Benefits Realisation Guidance for ePrescribing Projects*, NHS England, Quarry House, Leeds, England.

Starkweather, D.B., Gelwicks, L. & Newcomer, R. 1975, "Delphi forecasting of health care organization", *Inquiry,* vol. 12, no. 1, pp. 37-46.

Stevenson, J. 2017, *personal communication-meeting*, King's College, London.

Stevenson, J., Parekh, N., Ali, K., Timeyin, J., Bremner, S., Van Der Cammen, T., Allen, J., Schiff, R., Harchowal, J. & Davies, G. 2016, "Protocol for a Prospective (P) study to develop a model to stratify the risk (RI) of medication (M) related harm in hospitalized elderly (E) patients in the UK (The PRIME study)", *BMC Geriatrics,* vol. 16, no. 1, pp. 22.

Tam, V.C., Knowles, S.R., Cornish, P.L., Fine, N., Marchesano, R. & Etchells, E.E. 2005, "Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review", *Canadian Medical Association Journal,* vol. 173, no. 5, pp. 510-515.

Tan, B., Mulo, B. & Skinner, M. 2014, "Transition from hospital to primary care: an audit of discharge summary–medication changes and follow-up expectations", *Internal Medicine Journal,* vol. 44, no. 11, pp. 1124-1127.

Tan, B., Mulo, B. & Skinner, M. 2015, "Discharge documentation improvement project: a pilot study", *Internal Medicine Journal,* vol. 45, no. 12, pp. 1280-1285.

Tan, Y., Elliott, R.A., Richardson, B., Tanner, F.E. & Dorevitch, M.I. 2018, "An audit of the accuracy of medication information in electronic medical discharge summaries linked to an electronic prescribing system", *Health Information Management Journal,* (Online), March 27th 2018, Available from: DOI: 10.1177/1833358318765192. (Accessed 15th May 2018).

Tangiisuran, B., Gozzoli, M., Davies, J. & Rajkumar, C. 2010, "Adverse drug reactions in older people", *Reviews in Clinical Gerontology,* vol. 20, no. 3, pp. 246-259.

Tangiisuran, B., Davies, J.G., Wright, J.E. and Rajkumar, C., 2012. Adverse drug reactions in a population of hospitalized very elderly patients. *Drugs & aging*, *29*(8), pp.669-679.

Tangiisuran, B., Scutt, G., Stevenson, J., Wright, J., Onder, G., Petrovic, M., van der Cammen, Tischa J., Rajkumar, C. & Davies, G. 2014, "Development and validation of a risk model for predicting adverse drug reactions in older people during hospital stay: Brighton Adverse Drug Reactions Risk (BADRI) model", *PloS ONE,* vol. 9, no. 10, pp. e111254.

Tong, E.Y., Roman, C.P., Mitra, B., Yip, G.S., Gibbs, H., Newnham, H.H., Smit, D.V., Galbraith, K. & Dooley, M.J. 2017, "Reducing medication errors in hospital discharge summaries: a randomised controlled trial", *Medical Journal of Australia,* vol. 206, no. 1, pp. 36-39.

Trivalle, C., Burlaud, A., Ducimetière, P. & IMEPAG Group 2011, "Risk factors for adverse drug events in hospitalized elderly patients: a geriatric score", *European Geriatric Medicine,* vol. 2, no. 5, pp. 284-289.

Uitvlugt, E.B., Suijker, R., Janssen, M.J.A., Siegert, C.E.H. & Karapinar-Carkit, F. 2017, "Quality of medication related information in discharge letters: A prospective cohort study", *European Journal of Internal Medicine,* vol. 46, pp. e23-e25.

Unnewehr, M., Schaaf, B., Marev, R., Fitch, J. & Friederichs, H. 2015, "Optimizing the quality of hospital discharge summaries–a systematic review and practical tools", *Postgraduate Medicine,* vol. 127, no. 6, pp. 630-639.

van Walraven, C. & Rokosh, E. 1999, "What is necessary for high-quality discharge summaries?", *American Journal of Medical Quality,* vol. 14, no. 4, pp. 160-169.

Vernon, M. 2016*, When it comes to discharge, timing is everything, (*NHS England), (Online). Available from: https://www.england.nhs.uk/2016/09/martin-vernon-3/ (Accessed 15th January 2017).

Walsh, E., Sahm, L.J., Kearney, P.M., Smithson, H., Kerins, D.M., Ngwa, C., Fitzgerald, C., McCarthy, S., Connolly, E. & Dalton, K. 2018, "The PHARMS (Patient Held Active Record of Medication Status) feasibility study: a research proposal", *BMC Research Notes,* vol. 11, no. 1, pp. 6.

West, L.M., Diack, L., Cordina, M. & Stewart, D. 2015, "Applying the Delphi technique to define 'medication wastage'", *European Journal of Hospital Pharmacy,* vol. 22, no. 5, pp. 274-279.

WHO 2017*, WHO Collaborating Centre for Drug Statistics Methodology*, (World Health Organisation), (Online). Available from: https://www.whocc.no/ (Accessed 24th June 2017).

Wiles, L.K., Hibbert, P.D., Stephens, J.H., Coiera, E., Westbrook, J., Braithwaite, J., Day, R.O., Hillman, K.M. & Runciman, W.B. 2017, "STANDING Collaboration: a study protocol for developing clinical standards", *BMJ Open,* vol. 7, no. 10, pp. e014048-2016-014048.

Wilkes, L. 2015, "Using the Delphi technique in nursing research", *Nursing Standard,* vol. 29, no. 39, pp. 43-49.

Wilkin, M.E., Knight, A.T. & Boyce, L.E. 2018, "An audit of medication information in electronic discharge summaries for older patients discharged from medical wards at a regional hospital", *Journal of Pharmacy Practice and Research,* vol. 48, no. 1, pp. 76-79.

Willson, M.N., Greer, C.L. & Weeks, D.L. 2014, "Medication regimen complexity and hospital readmission for an adverse drug event", *Annals of Pharmacotherapy,* vol. 48, no. 1, pp. 26-32.

Wimmer, B.C., Bell, J.S., Fastbom, J., Wiese, M.D. & Johnell, K. 2016, "Medication regimen complexity and polypharmacy as factors associated with all-cause mortality in older people: a population-based cohort study", *Annals of Pharmacotherapy,* vol. 50, no. 2, pp. 89-95.

Wimsett, J., Harper, A. & Jones, P. 2014, "Components of a good quality discharge summary: A systematic review", *Emergency Medicine Australasia,* vol. 26, no. 5, pp. 430-438.

Wong, J.D., Bajcar, J.M., Wong, G.G., Alibhai, S.M., Huh, J.H., Cesta, A., Pond, G.R. & Fernandes, O.A. 2008, "Medication reconciliation at hospital discharge: evaluating discrepancies", *The Annals of Pharmacotherapy,* vol. 42, no. 10, pp. 1373-1379.

Worth, A., Nurmatov, U. & Sheikh, A. 2010, "Key components of anaphylaxis management plans: consensus findings from a national electronic Delphi study", *Journal of Royal Society of Medicine Short Reports (Open),* vol. 1, no. 5, pp. 1-9.

Wright, S., Morecroft, C.W., Mullen, R. & Ewing, A.B. 2017, "UK hospital patient discharge: the patient perspective", *European Journal of Hospital Pharmacy,* vol. 24, no. 6, pp. 338-342.

Yemm, R., Bhattacharya, D., Wright, D. & Poland, F. 2014, "What constitutes a high quality discharge summary? A comparison between the views of secondary and primary care doctors", *International Journal of Medical Education,* vol. 5, pp. 125-131.

Yousuf, M.I. 2007, "Using experts' opinions through Delphi technique", *Practical Assessment, Research & Evaluation,* vol. 12, no. 4, pp. 1-8.

Ziaeian, B., Araujo, K.L., Van Ness, P.H. & Horwitz, L.I. 2012, "Medication reconciliation accuracy and patient understanding of intended medication changes on hospital discharge", *Journal of General Internal Medicine,* vol. 27, no. 11, pp. 1513-1520.